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S'il est possible de perfectionner l'espèce
humaine, c'est dans la médecine qu'il faut
en chercher les moyens.
—Descartes

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Original Articles.

(Concluded.)

THE THERMIC PHENOMENA IN CONTRACTION OF MAMMALIAN MUSCLES.

(Second communication from the Leipzig Physiological Institute.[1])

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IN my first communication on the heat development of contracting muscle, I showed that in a long tetanus from maximal irritation, the muscle still in connection with the circulation at first rapidly increased in temperature until much warmer than the arterial blood; that the temperature then slowly increased until a maximum was reached, when, from the decreasing muscle temperature and the increasing arterial temperature, the temperatures of muscle and blood even during the tetanus commenced gradually to approach one another. No conclusion, however, was then drawn as to whether the fall of temperature toward the end of the tetanus was attributable to a more rapid loss of heat through the increase in the blood supply, or to a diminished heat production. The method which I have described above permits the alternate arresting and restoring of the blood supply, during the course of a tetanus of several minutes' duration, and therefore, by the variation of the conditions of the experiment, enables the formation of a

[1] See du Bois Raymond's *Archiv für Anatomie und Physiologie*, Physiologische Abtheilung, 1881, p. 105.

conclusion as to this point. For if the cessation of increase of temperature during a tetanus is due to the cooling influence of the blood, arrest of circulation should cause the temperature which had become constant, or even commenced to fall, to again commence to rise; if, however, under these circumstances the temperature does not increase, it must be concluded that heat production in the muscle has been interfered with, the degree being capable of recognition by the comparison of the temperature of the bloodless muscle during and after irritation.

In the following experiments of this nature, animals were selected which were especially capable of energetic heat production. In the first experiment the circulation was not disturbed during the irritation until the temperature of the muscle ceased to rise; in the second, the aorta was closed before the muscle temperature reached its maximum. In the first column of figures to the left is noted the temperature of the muscle immediately before the commencement of the irritation, the succession of figures to the right giving the temperature of the muscle during contraction at intervals of one minute. From the slightness of its changes, the thermometer readings of the arterial temperature are only given at the beginning and end of each period of the experiment; of these four periods, the first three represent contraction, the fourth rest.

The following curve (fig. 1) has been constructed from the figures of the preceding table. The upper heavy curve represents the temperature-changes in the muscle; the lower lighter curve, the temperature of the blood. The intervals on the abscissa line correspond to minutes; the heavy ordinates represent the blood-pressure in the femoral artery in millimetres of mercury, while the dotted perpendicular lines represent the duration of irritation and of closure of the aorta.

It is to be noticed in the above experiment that before

I.

Tetanus.   **Rest.**

1. Aorta open.

Time after Commencement of Irritation, in Minutes.

	1	2	3	4	5	Total Change in Temperature.
Muscle temperature .	37.83 38.39	38.55	38.70	38.76	38.80° C.	+0.97°
Temperature increase	. 0.56	0.16	0.15	0.06	0.04° C.	
Temperature of blood	37.70				37.75° C.	

2. Aorta closed.

Time after Commencement of Irritation, in Minutes.

	6	7	8	9	Total Change in Temperature.
Muscle temperature .	38.80	38.80	38.80	38.80	0°
Temperature increase	0.0	0.0	0.0	0.0	
		37.75	37.72		

3. Aorta opened.

Time after Commencement of Irritation, in Minutes.

	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Total Change in Temperature.
Muscle temperature .	38.80	38.55	38.45	38.30	38.18	38.10	38.08	38.04	38.00	38.00	38.00	38.00	38.00	38.00	38.00	−0.80°
Temperature decrease	0.0	−0.25	−0.10	−0.15	−0.12	−0.08	−0.02	−0.04	−0.04	0.0	0.0	0.0	0.0	0.0	0.0	
Temperature of blood	37.70	37.75	37.72											37.70		

4. Aorta open. — No irritation.

Time after End of Irritation, in Minutes.

	1	2	3	4	Total Change in Temperature.
Muscle temperature .	38.0 37.95	37.94	37.92	37.87	−0.13°
Temperature decrease	−0.05	−0.01	−0.02	−0.05	
Temperature of blood	37.70 37.75	37.72		37.70	

the commencement of irritation the temperature of the
muscle was 0.13° C. warmer than the arterial blood and that
in the first four minutes of contraction this difference was
increased to 1.05° C. As the temperature of the muscle
then remained constant for thirty seconds, in the presence
of the circulation, it was to be expected that if the circula-
tion was arrested, and so one source of cooling removed,

Fig. 1.
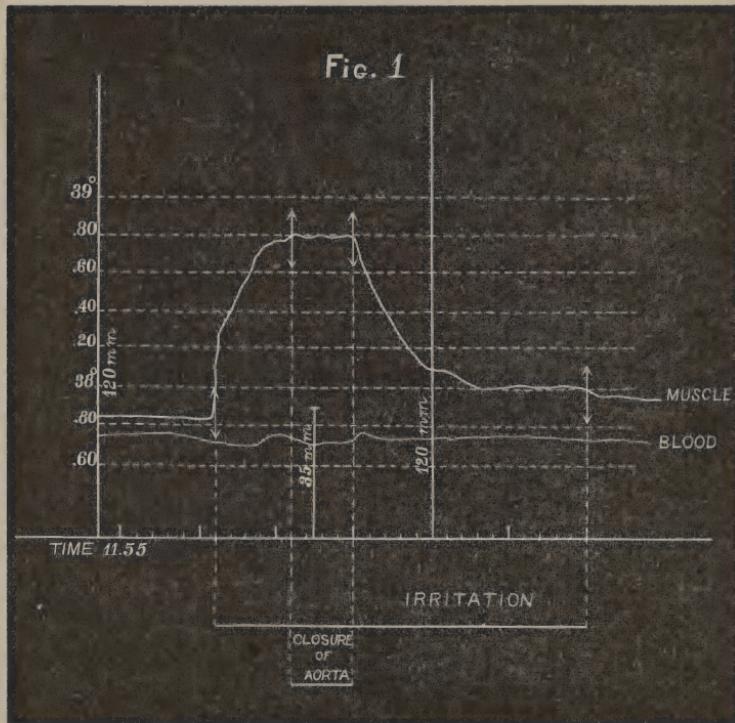
the temperature of the muscle would again ascend.
Such was not, however, the case : the muscle temperature
remained constant during the four minutes that the aorta
was closed, and then rapidly sank, when the blood current
was restored, to within 0.28° C. of its original temperature,
where it remained unaltered until the end of the contraction
and then slowly sank to its original stand.

II.

Tetanus

1. Aorta open.

		1	2	2½	Total Change in Temperature.
Muscle temperature . .	38.37	38.85	39.07	39.23° C.	+ 0.86° C.
Temperature increase .		0.48	0.22	0.16° C.	
Temperature of blood .	38.08			38.08° C.	

Time after Commencement of Irritation, in Minutes.

2. Aorta closed.

	3	4	5	6	7	Total Change in Temperature.
Muscle temperature . .	39.23	39.26	39.27	39.28	39.30	+ 0.07°
Temperature increase .		0.03	0.01	0.01	0.02	

Time after Commencement of Irritation, in Minutes.

3. Aorta opened.

	8	9	10	11	12	13	14	Total Change in Temperature.
Muscle temperature . .	39.30	39.15	38.84	38.83	38.83	38.77	38.74	− 0.56°
Temperature decrease .		− 0.15	− 0.31	− 0.01	0.0	− 0.06	− 0.03	
Temperature of blood .	37.95	38.21		38.18			38.17	

Time after Commencement of Irritation, in Minutes.

Rest

4. Aorta open.—No irritation.

		1	2	3	4	5	6	7	8	9	Total Change in Temperature.
Muscle temperature . .	38.74	38.56	38.45	38.36	38.29	38.29	38.29	38.29	38.29	38.29	− 0.45°
Temperature decrease .		− 0.18	− 0.11	− 0.09	− 0.07	0.0	0.0	0.0	0.0	0.0	
Temperature of blood .	38.21	38.18		38.18			38.15				

Time after End of Irritation, in Minutes.

The same explanations apply to the following curve, constructed from the above table, as were given for fig. 1.

The above experiment differs from No. I. of the same series in that in this instance the aorta was closed two and a half minutes, instead of five minutes, after the commencement of the irritation, and consequently before the maximum temperature was reached by the muscle; it was
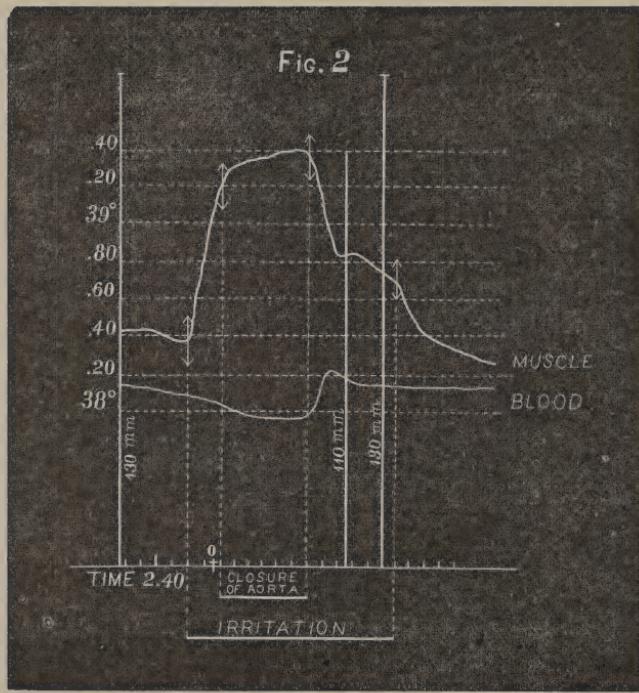
FIG. 2, *a.*

therefore to be expected that the temperature would continue to rise after the arrest of the circulation, and it was found that while the muscle increased from 0.29° C. above the temperature of the blood to 1.15° C. in the first period of the experiment, there was a still further gradual addition during the first four minutes, when the aorta was closed. When, however, the circulation was reopened, the muscle temperature fell in two minutes to within 0.63° C. of the

blood temperature, remained nearly constant at this point for two minutes, and then gradually sank still farther during the remainder of the tetanus. When the irritation ceased, the muscle temperature then sank to within 0.14° C. of that of the blood, or 0.15° C. lower than its original position.

By examination of fig. 1 it will be seen that the blood-pressure in the femoral arteries, which at the commencement of the closure of the aorta stood at 0, rose to 30 mm. mercury before the aorta was reopened, from the causes already mentioned in the commencement of this communication as explaining that occurrence. But from the fact that the general course of the experiment corresponds very closely with that of the second experiment, where the closure of the aorta remained complete, it must be concluded that the current in the first case was too feeble to influence the thermic conditions of the muscle.

It may therefore be concluded that the temperature-changes of a muscle in connection with the circulation and contracting under the influence of maximal irritation are dependent mainly upon changes in the heat production of that muscle; and that the heat production which is most intense at the commencement of contractions, gradually decreases in energy until almost entirely suspended. Another fact in favor of this explanation is that during the period in which the temperature-increase commences to decline, the circulation through the muscle remains nearly constant; therefore, since the cessation of increase of temperature cannot be attributed to an increase in loss of heat through an increased circulation, it must be due to diminished heat production. And since we have found that after the arrest of circulation there is no further increase in the temperature of the muscle, diminished heat-production must also be concerned in the fall of temperature which occurs toward the end of prolonged tetani, even when the circulation has not been interfered with.

In order to form a conclusion as to whether the presence of the arterial blood increases the capability of developing heat, the temperature-changes of the normal and bloodless muscles, thrown into contraction by maximal irritation, must be compared. From what has already been stated, it is evident that an excess of heat production in the normal muscle[1] over that produced by the muscle removed from its blood-supply, can only be admitted when the degree and duration of temperature-increase in the first, under unfavorable conditions, largely exceed those developed under more favorable conditions in the latter. Accordingly, from the fact that the results of fatigue are not completely removable by short periods of repose, in the comparison of the degrees of heat production of the bloodless and normal muscle the contraction of the bloodless muscle must precede that of the muscle still supplied with blood. If under such conditions the normal muscle acquires a higher temperature and maintains it longer than the bloodless muscle, the presence of the circulation must aid the development of a larger amount of heat, for the muscle still within the circulation is more fatigued and subject to greater loss of heat than the bloodless muscle.

Of the facts brought out in my experiments made after the above plan, I will first give the comparisons of the maximum temperature-increase produced by irritation of the bloodless and normal muscle.

No. I.—1st. Tetanus. *Without circulation.* Temperature increased from 39.25° to 39.63° C. Maximum = 0.38° C.

2d. Tetanus. *With circulation.* Temperature increased from 39.46° to 39.96° C. Maximum = 0.50° C. Muscle temperature 0.49° C. over blood.

3d. Tetanus. *Without circulation.* Temperature increased from 39.65° to 39.95° C. Maximum = 0.30° C.

4th. Tetanus. *With circulation.* Temperature increased from

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[1] This term will be repeatedly employed to designate a muscle whose circulation has not been interfered with.

39.75° to 40.12° C. Maximum = 0.37° C. Muscle temperature 0.40° C. over blood.

No. II.—1st Tetanus. *Without circulation.* Temperature increased from 34.59° to 35.11° C. Maximum = 0.52° C.

2d. Tetanus. *With circulation.* Temperature increased from 34.59° to 35.27° C. Maximum = 0.68° C. Muscle temperature 0.80° C. over blood.

No. III.—1st. Tetanus. *Without circulation.* Temperature increased from 38.27° to 38.68° C. Maximum = 0.41° C.

2d. Tetanus. *With circulation.* Temperature increased from 38.08° to 38.84° C. Maximum = 0.76° C. Muscle temperature 0.83° C. over blood.

No. IV.—1st. Tetanus. *Without circulation.* Temperature increased from 32.75° to 33.13° C. Maximum = 0.38° C.

2d. Tetanus. *With circulation.* Temperature increased from 32.10° to 32.54° C. Maximum = 0.44° C. Muscle temperature 1.07° C. over blood.

No. V.—1st. Tetanus. *Without circulation.* Temperature increased from 39.26° to 39.72° C. Maximum = 0.46° C.

2d. Tetanus. *With circulation.* Temperature increased from 39.10° to 39.50° C. Maximum = 0.40° C. Muscle temperature 0.32° C. over blood.

Taking an average from the above figures, we find that for the fresh bloodless muscle, protected from loss of heat through the blood, the maximum increase of temperature as a mean was 0.41° C., while for the muscle which entered contraction while already in a condition of fatigue, and through which blood was circulating, which, as an average, was 0.65° cooler than the temperature reached by the muscle, the average maximum increase of temperature was 0.53° C. The share of the blood in the heat development by the muscles is still further emphasized when it is noticed that, with a single exception, in all the above experiments the increase of temperature was much greater in the case of the fatigued muscles which still had their normal blood supply, than in the fresh bloodless muscles; and in the one exceptional case the temperature of the fresh bloodless muscle was only 0.06° C. higher than the more fatigued muscle which still had its blood supply.

In order to form any idea as to the manner in which the blood influences the temperature-changes in contracting muscle, a distinction must be drawn between the characters of the circulation in different periods of contraction. For, at the onset of contraction the circulation through the muscle, as Gaskell has shown,[1] is slackened to such an extent that the conditions are very much the same in the muscles with normal blood supply, and in those whose circulation has been arrested by closure of the aorta, rendering it probable that in the early stages of contraction the development of heat is equal in both instances; since even in the normal muscle the heat development occurs so rapidly that the changes occurring in the interior of the muscle are at first uninfluenced by the sluggish blood-stream. The following table gives the result of my experiments on the influence of the blood current on heat production in the later stages of contraction. The first column of temperature-figures to the left gives the temperature of the muscle immediately before the commencement of contraction, the following figures giving the increase in temperature at every subsequent thirty seconds.

From the commencement of the tetanic irritation until the thirtieth second the temperature increases in the normal and bloodless muscles with nearly equal rapidity; in the subsequent periods of the tetanus, however, we find a marked difference. With the exception of a single case we find that in the bloodless muscle the maximum temperature-increase is always attained within one and a half to three minutes, while in the muscles still within the circulation the temperature continues to increase for two and a half to four and a half minutes. From the fact, therefore, that the normal contracting muscle is able to produce heat for a longer period than the bloodless muscle, it is evident that the blood enables the normal muscle to prolong the heat-

[1] "Arbeiten des Leipziger physiolog. Instituts," 1877.

Time after commenc'm'nt of contract'n.	30"	1 min.	1½ min.	2 min.	2½ min.	3 min.	3½ min.	4 min.	4½ min.	5 min.	5½ min.	6 min.	6½ min.	
I.														
1st. Tetanus 39.25°	+ 0.22	+ 0.14	+ 0.02	0.00	+ 0.0									Without circulation.
2d. Tetanus 39.46°	+ 0.27	+ 0.14	+ 0.08	+ 0.02										With circulation.
3d. Tetanus 39.65°	+ 0.22	+ 0.06	+ 0.02	0.00										Without circulation.
II.														
1st. Tetanus 34.59°	+ 0.14	?	+ 0.05	+ 0.04	+ 0.04	+ 0.06	+ 0.02		+ 0.04	?	+ 0.05	?	+ 0.05	Without circulation.
2d. Tetanus 34.39°	+ 0.25	+ 0.11	+ 0.12	+ 0.08	+ 0.06	+ 0.04	+ 0.01	0.						With circulation.
3d. Tetanus 34.50°	+ 0.20	+ 0.08	+ 0.02	+ 0.02	0.0									Without circulation.
III.														
1st. Tetanus 37.83°	+ 0.46	+ 0.10	+ 0.06	+ 0.10	+ 0.06	+ 0.09	+ 0.05	+ 0.01	+ 0.03	0.0				With circulation.
2d. Tetanus 38.27°	+ 0.24	+ 0.06	+ 0.02	+ 0.01	+ 0.03									Without circulation.
3d. Tetanus 38.08°	+ 0.22	+ 0.24	+ 0.16	+ 0.08	+ 0.05	+ 0.01	0.0							With circulation.
4th. Tetanus 38.27°	+ 0.20	+ 0.10	+ 0.05	+ 0.03										Without circulation.
IV.														
1st. Tetanus 39.38°	?	+ 0.32	+ 0.18	+ 0.02	+ 0.11	+ 0.06	+ 0.03	0.0						With circulation.
2d. Tetanus 39.64°	+ 0.23	+ 0.04	+ 0.02	+ 0.01	+ 0.01	+ 0.03	0.0	0.0						Without circulation.
3d. Tetanus 39.27°	+ 0.28	+ 0.09	+ 0.13	+ 0.14	+ 0.09	+ 0.07	+ 0.03	+ 0.01						With circulation.

producing changes which at first are of equal intensity in both bloodless and normal muscles.

We see, therefore, that the blood not only in the periods of rest, but also during tetanic contraction, modifies the thermic phenomena in muscles.

That the above rule is not without exceptions is seen in the first tetanus of No. II. of the above series. There the temperature in the bloodless muscle continued to increase for six and a half minutes, though this tetanus differed from the other tetani in the same animal and in the others of the same series by the extreme slowness with which the maximum temperature was attained; since in the six and a half minutes during which the increase in temperature continued the maximum reached was only 0.52° C. as contrasted with an increase of 0.62° C. attained in the following tetanus of only three and a half minutes, when the muscles were still within the circulation.

If the changes leading to a development of heat in the contraction of bloodless muscles are hindered by the absence of oxygenated blood, it is conceivable that the reopening of the circulation during a tetanus of bloodless muscles after the increase of temperature had ceased might again furnish the necessary conditions for the further development of heat in such a degree as to cause a second increase of temperature. Such a state of affairs occurred in several of my experiments, as seen in the following table.

		Muscle Temperature.	Temperature-Increase in each Minute.					Total Increase.
I.	Aorta closed.	34.34° C.	+0.18, +0.02, +0.01,	0.00,			+0.21° C.
	Aorta opened.		+0.05, +0.08, +0.04,	+0.04,	0.04,		+0.23° C.
		Muscle temperature +0.68° C. over blood.					
II.	Aorta closed.	38.27° C.	+0.30, +0.08, +0.0,				+0.38° C.
	Aorta opened.		+0.07, +0.13, +0.08,	+0.03,			+0.31° C.
		Muscle temperature +0.77° C. over blood.					
III.	Aorta closed.	36.21° C.	+0.24, +0.0,				+0.24° C.
	Aorta opened.		+0.08, +0.13, +0.03,	+0.01,	0.00,		+0.25° C.
		Muscle temperature +0.70° C. over blood.					

The following curve, constructed from the figures of the third tetani of the above series, serves to make the results of the above experiments more evident; the same explanations apply as in the case of fig. 1.

The above experiments, which are confirmed by several others, greatly assist in the explanation of the share of the blood in the internal changes in contracting muscles.   For
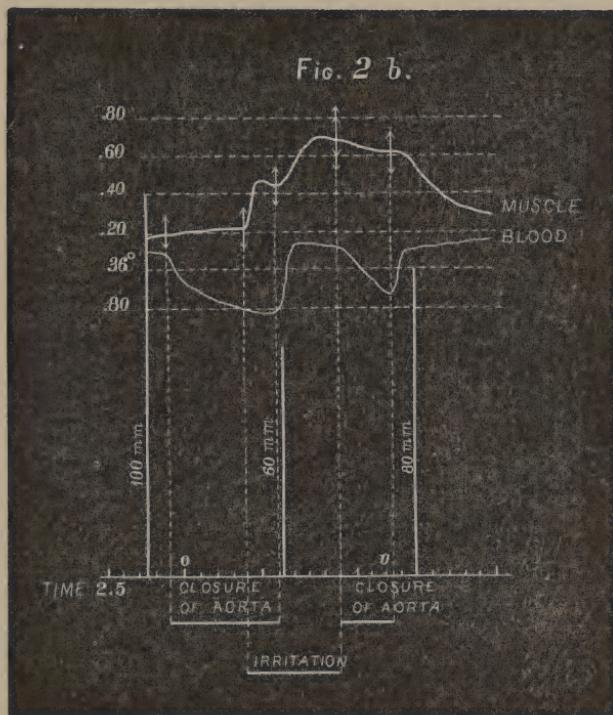
FIG. 2, *b*.

the chemical processes, which in contracting bloodless muscles have sufficient energy to develop enough heat to maintain the muscle temperature from 0.2° to 0.4° above that of the surrounding media, are so increased in energy with the restoration of the circulation that the muscles still further increase in temperature; in spite of the loss of heat attendant upon the circulation of a blood current which may be from 0.68° to 0.77° C. cooler than the muscle.

Although I have notes of several other experiments which give the same general results as detailed above, the reopening of the circulation in bloodless muscles during the course of a contraction does not invariably produce such an increase of temperature as in the examples given above. Sometimes the temperature only increases a few hundredths of a degree, and often the cooling influence preponderates over the assistance to heat production; the latter is almost invariably the case when the contraction has lasted more than six minutes before the circulation is reopened.

In the cases which have as yet been considered the muscles which were subjected to irritation, after being deprived of their blood supply, were, during the greater part of the long intervals of repose which followed each contraction, again receiving their normal blood supply. And, although at the end of the contraction the temperature of such muscle was not as greatly increased as after contraction with normal blood supply, the muscle temperature of the bloodless muscle was, nevertheless, considerably above its original temperature and that of its surrounding media.

The following modifications of the plan of procedure were made to permit of the study of the influence which the blood-current exerts on resting muscle after being fatigued and warmed by previous contraction.

The muscles, either with or without their normal blood supply, were first subjected to prolonged irritation; coincident with the cessation of irritation, the aorta was closed (if the circulation had not been already arrested, or was not restored if already closed) and the muscles, deprived of their blood-supply, allowed to rest for ten or fifteen minutes, and then again thrown into contraction without renewing the circulation. Therefore, the muscles were compelled to recover from their fatigue and again contract without re-

ceiving any assistance from the arterial blood. These conditions, therefore, reduced the mammalian muscles to the state which alone exists in excised frog's muscles.

Experiments made on the above plan, showed that the muscles, after irritation and an interval of rest while removed from the circulation, were again able to develop heat when again thrown into contraction, but to a considerably less degree than when, after contracting in the bloodless condition, they were a second time thrown into tetanus after an interval of rest in which the circulation was present.

The following experiments show that in the resting muscle contact with the arterial blood facilitates the development of heat in contraction.

	Initial Temperature.	Maximum Increase.
I.		
1st *Tetanus.*—The muscles had rested for half an hour with normal blood supply. The aorta was closed at commencement of irritation .	39.26° C.	0.46° C.
2d *Tetanus.*—The aorta was kept closed during an interval of rest of ten minutes after the first tetanus and during the second tetanus .	39.46° C.	0.08° C.
3d *Tetanus.*—The aorta was opened after the end of the second tetanus, and the circulation was undisturbed during a pause of ten minutes after the second tetanus, and during the third tetanus	39.10° C.	0.40° C.

Muscle temperature + 0.30° C. over blood.

The course of the above experiment is reproduced in the following curve (fig. 2, *c*):

	Initial Temperature.	Maximum Increase.
II.		
1st *Tetanus.*—Duration = 7 minutes. During the tetanus and during a pause of ten minutes before the tetanus the aorta was open .	39.44° C.	+ 1.00° C.

Muscle temperature + 1.00° C. over blood.

| 2d *Tetanus.*—Duration = 5 minutes. The aorta was closed immediately after the end of first tetanus, and kept closed during a pause of fifteen [1] minutes, and during second tetanus . . . . | 39.97° C. | + 0.23° C. |
| 3d *Tetanus.*—Duration = 5 minutes. The aorta was opened immediately after end of | | |

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[1] During the long closure of the aorta, the circulation was not all the time completely arrested ; the pressure in the crural artery, however, during this time, never rose above 10 mm. Hg.

second tetanus and kept open during the subsequent pause of fifteen minutes, and during the third tetanus   .   .   .   .   39.48° C.   + 0.74° C.

Muscle temperature + 0.75° C. over blood.

4th Tetanus.[1]—Duration = 6 minutes. The aorta was closed immediately after the end of the third tetanus and kept closed during the subsequent pause of twenty minutes, and during the fourth tetanus   .   .   .   .   39.87° C.   + 0.34° C.
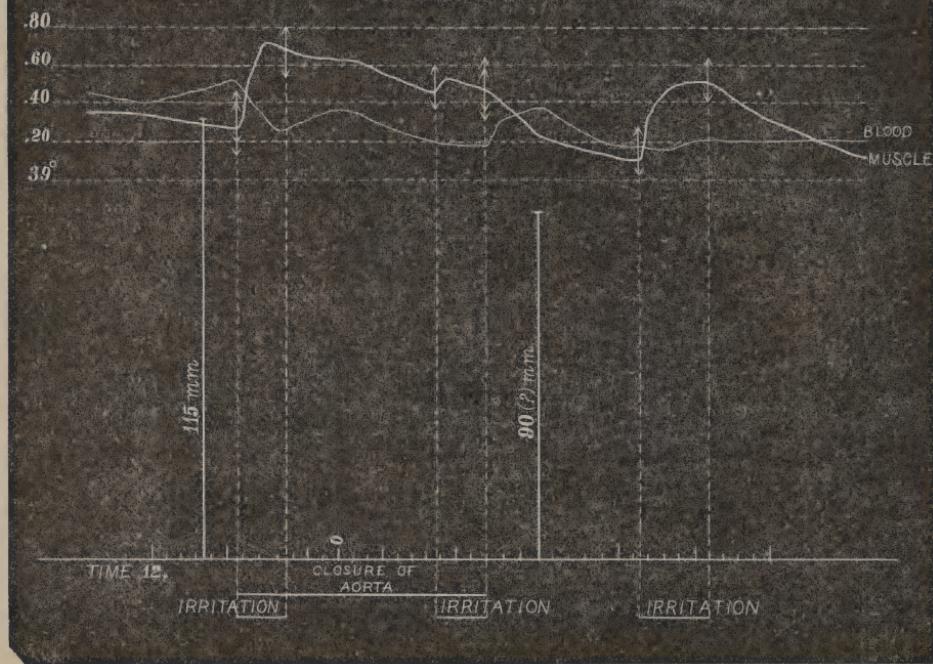
FIG. 2, c.

5th Tetanus.—Duration = 9 minutes. Immediately after the end of the fourth tetanus the aorta was opened and kept open during the subsequent pause of twenty minutes, and during the fifth tetanus   .   .   .   .   39.33° C.   + 0.85° C.

Muscle temperature + 0.60° C. over blood.

III.

1st Tetanus.—Duration = 5 minutes. Aorta open during the course of this tetanus and for the preceding ten minutes' rest   .   .   .   38.35° C.   + 0.80° C. (?)

Muscle temperature + 0.60° C. over blood.

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[1] Up to this time sub-maximal irritation had been employed ; the strength of the current was now increased up to a maximal irritation.

2d Tetanus.—Duration = 5 minutes. Aorta was closed immediately after end of first tetanus and kept closed during the subsequent pause of ten minutes, and during second tetanus . 38.71° C. + 0.1° C.

3d Tetanus.—Duration = 5 minutes. The aorta was opened immediately after the end of the second tetanus and kept open during the subsequent pause of ten minutes, and during the third tetanus . . . . . . 38.22° C. + 0.53° C.

Muscle temperature + 0.53° C. over blood.

It is seen from the above that the resting bloodless muscle can recover from its inability of developing heat, but that this recovery is much more imperfect than when the circulation is present, and that the rapid initial rise of temperature is also in such cases absent. The excess of heat production, therefore, in a muscle which is supplied with blood during its period of rest, and deprived of it during its contraction, over that of the muscle removed from the circulation in both these periods, proves that the arterial blood plays an important part in the conditions essential to heat production by muscles. For were the amount of heat dependent on the store of combustible matter in the muscle, it is clear that the muscle removed from the circulation must liberate less heat than one whose blood-supply is undisturbed.

If fatigued muscles, in the absence of their blood supply, only slightly recover their capacity for heat production, and if, on the other hand, the normal muscle develops more heat in its contraction than the bloodless muscle, the assumption is warrantable that by reversing the conditions of the experiment the course of the temperature-changes in muscle may be radically changed. Therefore, if a fatigued muscle is deprived of its blood supply during its period of rest, and the circulation restored at the moment of commencement of a second irritation, if the above views are correct, the initial increase of temperature will be much less than in the normal muscle, but it will be more gradual and prolonged. The following experiment was performed to test the truth of these arguments:

1st Tetanus — The circulation was undisturbed before and during the irritation.

Muscle temperature, 37.94°.

TIME (Minutes)	½	1	1½	2	2½	3	3½	4	4½	5	5½	Total Increase.
Muscle temperature	38.17	38.26	38.35	38.45	38.54	38.61	38.67	38.71	38.73	38.76	38.77	+0.83° C.
Increase in each 30″	0.23	0.09	0.09	0.10	0.09	0.07	0.06	0.04	0.02	0.03	0.01	

The difference in temperature of the muscle over that of the blood increased from −0.01° to +0.80° C.

2d Tetanus — The circulation was arrested immediately after end of first tetanus, and aorta kept closed during fifteen minutes' rest, and then opened at commencement of second tetanus.

Muscle temperature, 38.17°.

TIME (Minutes)	½	1	1½	2	2½	3	3½	4	4½	5	5½	6	6½	7	7½	8	Total Increase.
Muscle temperature	38.16	38.19	38.21	38.24	38.27	38.31	38.37	38.42	38.49	38.53	38.58	38.61	38.63	38.63	38.63		+0.46° C.
Increase in each 30″	0.01	0.03	0.02	0.03	0.03	0.04	0.06	0.05	0.07	0.04	0.05	0.03	0.02	0.0	0.0		

The difference in temperature of the muscle over that of the blood increased from +0.17° to +0.70° C.

3d Tetanus — The circulation was undisturbed during a pause of fifteen minutes after the second tetanus and during the third tetanus.

Muscle temperature, 38.08°.

TIME (Minutes)	½	1	1½	2	2½	3	3½	4	4½	Total Increase.
Muscle temperature	38.18	38.28	38.46	38.51	38.54	38.58	38.59	38.60	38.60	+0.52° C.
Increase in each 30″	0.10	0.10	0.18	0.05	0.03	0.04	0.01	0.01	0.0	

The difference in temperature of the muscle over that of the blood increased from +0.13° to +0.54° C.

The following curve was constructed from the first and second tetani of the above experiment, in order to render the contrast between the rate of increase of temperature more evident.

It is thus seen that the arterial blood plays an important part both in the formation of the heat-giving substances in resting muscle, and in their combustion in contraction; and that even if, although not yet proven, the difference be-
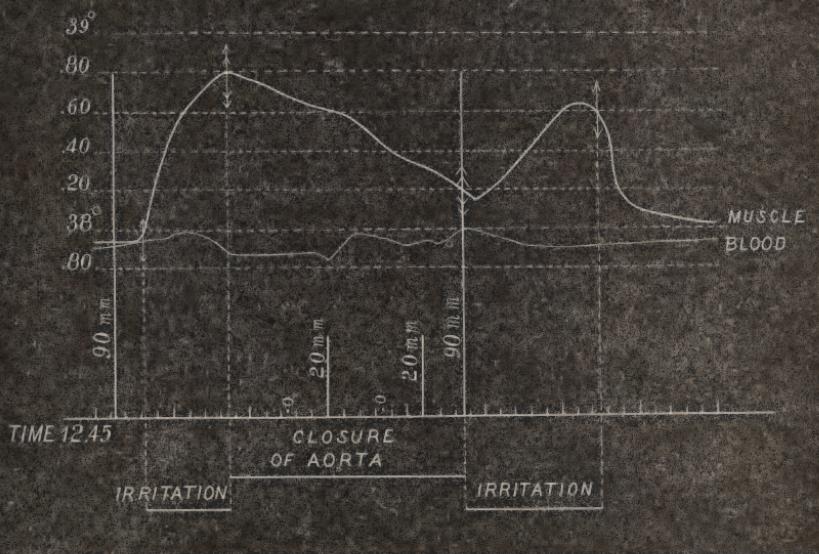
FIG. 3.

tween the bloodless muscle and the muscle still in connection with the circulation is simply a quantitative one, it is nevertheless too important to be neglected. The restriction, therefore, of study to the bloodless muscle alone would be open to the same objection as the application of conclusions drawn from the study of the tissue-changes during hunger to the general metabolic processes of the body. Perhaps in the future it may be possible to isolate the sub-

stances in muscle through whose combustion heat is developed; but even should this most difficult problem in the chemistry of muscle be solved, measurements of temperature-changes during contraction in the normal muscle, as to their duration and character from the commencement of contraction to the highest degree of fatigue, must still furnish an indispensable and accurate means of studying the course of the process of combustion of those bodies. And, finally, it is only by the study of the temperature-changes in the resting and contracting muscle while still within the circulation, that any idea can be formed as to the share which the muscles play in maintaining the general body temperature; while the comparison of the behavior of the normal and bloodless muscle in this connection is alone sufficient to render indispensable investigations similar to those detailed above.

The Relation between the Work and Heat Production in Contracting Muscles.

The question as to the relation between the work accomplished by the contracting muscle and the amount of heat developed in contraction, must at present be confined to the consideration of the question as to whether under like conditions of irritation and arterial blood-supply the development of heat and change in form vary in direct proportion; for the elaborate and valuable conclusions drawn by Fick as to the laws governing muscular contraction are not applicable to a tetanus which accomplishes no work. To simplify this problem the influence exerted by the blood-current on the course and degree of contraction will be first considered.

If the circulation through the aorta is arrested only a few minutes before or simultaneously with the stimulation of the resting nerve and muscle, a maximal irritation produces

a lift which is equal in height to that produced by the normal muscle. But while the energy of contraction is at first equal in both instances, the bloodless muscle rapidly lengthens during the stimulation, so that within one or two minutes after the commencement of irritation the muscle has regained its original length, even though there has been no decrease in the strength of the current applied to the nerve. The following figures illustrate the striking difference between the duration of shortening in the bloodless and normal muscle when subjected to equal stimuli.

a. 1st Tetanus.—*Circulation arrested.* Lift at commencement of irritation = 140 mm.
After tetanus of one minute's duration : lift = 11 mm ; or, as 100 : 7.

2d. Tetanus.—*Circulation normal.* Lift at commencement of irritation = 140 mm.
After tetanus of seven minutes' duration : lift = 121 mm.; or, as 100 : 86.

b. 1st. Tetanus.—*Circulation arrested.* Lift at commencement of irritation = 145 mm.
After tetanus of five minutes' duration : lift = 55 mm.; or, as 100 : 38.

2d. Tetanus.—*Circulation normal.* Lift at commencement of irritation = 140 mm.
After tetanus of five minutes' duration : lift = 106 mm.; or, as 100 : 75.

c. 1st. Tetanus.—*Circulation normal.* Lift at commencement of irritation = 125 mm.
After tetanus of three minutes' duration ; lift = 105 mm.; or, as 102 : 84.

2d. Tetanus.—*Circulation arrested.* Lift at commencement of of irritation = 110 mm.
After tetanus of one minute's duration : lift = 0 mm.; or, as 100 : 0.

The favorable influence exerted by the blood current on muscular contractility is also seen in cases where the aorta is first closed and then opened during an irritation. In such

cases, if the muscles were not already fatigued by previous contraction, and if the aorta had not been closed more than a few minutes, when the circulation was restored during the stimulation, the muscle which had become almost entirely relaxed again shortened, though the degree of contraction never reached the point first attained at the commencement of the irritation.

If, on the other hand, the muscle had been already repeatedly tetanized, or if the blood supply had been arrested for a number of minutes, with the restoration of circulation there only occurs a very slow and incomplete return of contractility; showing that recovery only slowly occurs on restoring the blood supply to muscles injured by prolonged irritation and deprivation of blood. Finally, when the experiment as described above is performed on muscles highly fatigued by prolonged and repeated irritations, on reopening the circulation there is no return of contractile energy to the muscle, and the weight is not lifted above its height at the end of the period during which the circulation was closed.

If, in the first place, we compare the energies of contraction and heat-production in the stimulation of bloodless muscles, it is seen that in both the changes run in the same direction. At the commencement of irritation the muscle suddenly attains its highest degree of shortening, and simultaneously the heat-production, which is feeble during rest, is suddenly increased. It must be granted that the rapidity with which the thermometer indicates the maximum temperature falls far short of the rapidity with which the muscle shortens; but this does not necessarily indicate a slower development of heat, for even were the heat instantaneously developed, the low conductivity of the muscle mass and of the glass would require time before the increased temperature could be indicated by the thermometer.

Further, the relaxation, which is rapid in the first few minutes, becomes more and more gradual during the prolongation of the stimulation, and completes the analogy to the temperature changes, for the increase of temperature, which at first is rapid, becomes less and less as the stimulation is prolonged.

The following examples are selected from twenty experiments made on eight different dogs, and may be regarded as giving the possible extremes, as in the first example the evidences of fatigue were only slowly developed, while the muscle rapidly lost its contractility in the second.

Time after commencement of contraction in minutes . .		$\frac{1}{2}$	1	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	$3\frac{1}{2}$	4	$4\frac{1}{2}$	5	$5\frac{1}{2}$	6
I.													
Lift, in mms. .	145		75	65	65	65	65	55	55	52	52	52	52
Muscle temperature . .	39.59°												
Increase in each 30 seconds .		0.14	0.05	0.04	0.04	0.06	0.02	0.03	0.04	0.02	0.03	0.02	0.03
II.													
Lift, in mms. .	141	136	121	51	6	6							
Muscle temperature . .	39.25°												
Increase in each 30 seconds .		0.22	0.14	0.02	0.0	0.0							

The analogy of changes in the capabilities of the irritated muscle of developing heat and of contracting is still further preserved in the fact that, though both results of irritation have ceased to appear in a muscle fatigued by prolonged weak stimulation, when a maximal is then substituted for a sub-maximal irritation both heat development and shortening again reappear. The following examples serve to illustrate this point; both were obtained from the irritation of the same muscle, one during closure of the circulation, and one during normal blood supply. Their comparison serves to show how closely the muscular energy is dependent on

the blood supply. The temperature is given for each thirty seconds after commencement of the tetanus:

1st Tetanus.—*Circulation Arrested :*

	Sub-maximal irritation.									Maximal irritation.	
Lift, in mms. . . .	40	10.	0						0	75	59
Muscle temperature .	39.87°,	39.87,	39.92,	39.95,	39.97,	? 39.98,	? 39.98,	39.97		40.16,	40.21

2d Tetanus.—*Circulation Normal :*

	Sub-maximal irritation.											
Lift, in mms.	55		53		47		44				37	30
Muscle temperature .	39.33°,	39.40,	39.47,	39.54,	39.60,	39.65,	39.69,	39.72,	39.74,	39.77,	39.79,	39.80, 39.82

Maximal irritation.

Lift, in mms. . . .	89	80
Muscle temperature .	40.08,	40.22, 40.30, 40.30

The following curves, fig. 4, *a.*, and fig. 4, *b.*, are constructed from tetanus 1 and 2, respectively; the shaded portion of the figure represents the course of the lift.

Fig. 4 A
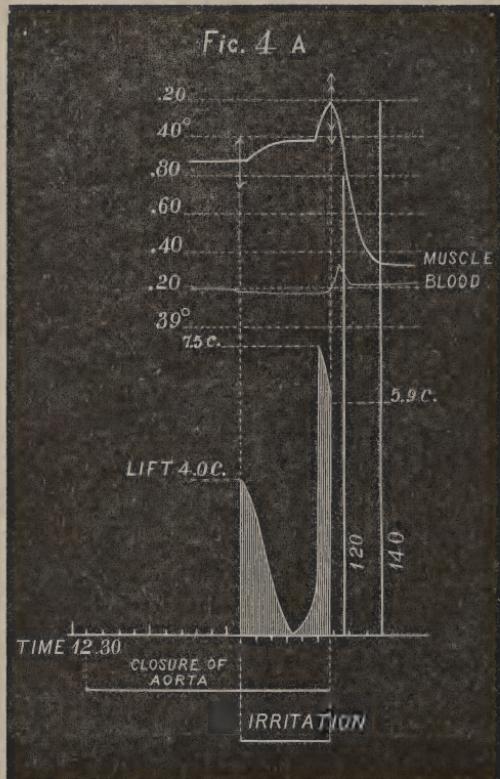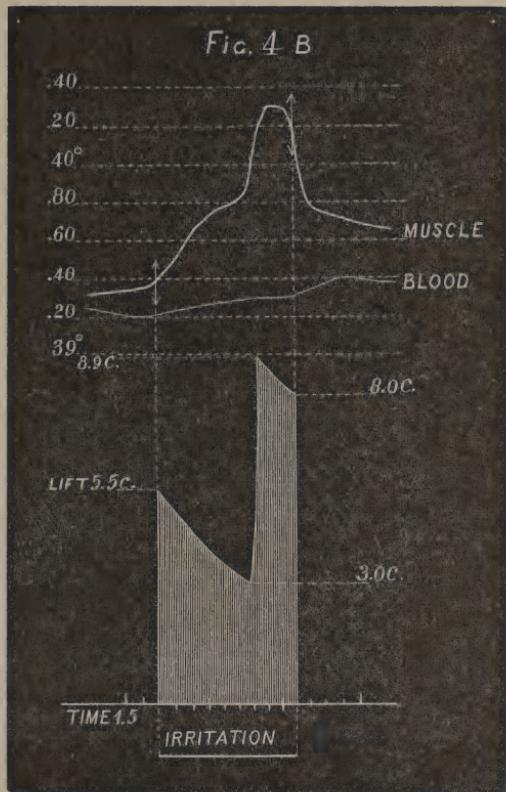
In the muscle which still receives its normal supply of arterial blood the same relation still holds between the energies manifested in the development of heat and accomplishment of work: both forms of energy commence together and disappear together. But it cannot be concluded from this qualitative coincidence that the relation between the liberation of heat and contraction is the same in the bloodless and normal muscle. That with the presence of arterial blood this relation differs from that of the bloodless muscle is suggested by the observations of Heidenhain, which show that in prolonged work the muscle loses its power of developing heat before its contractility is lost; and consequently the invigorating action of the arterial blood supply must produce a different influence on the

potential energies of the muscle from that exerted by the fatiguing contraction.

On the solution of this problem depends the most important deduction as to the internal processes in contracting muscle. For if the muscle in accomplishing equal degrees of work can develop unequal amounts of heat, the relation between these two phenomena can be but a limited one, and, as far as I can see, can only be explained in one of two ways : either through alteration in the relative inert mass of the muscle ; or from the production by the irritation of two different kinds of internal rearrangement, one manifested by change in form, the other by development of heat.

In the muscle, as in all other machines, the position of the point of application of the force has an important influence on the result. And if, consistently with the conditions of life, changes may take place which permit of a more advantageous application of the force, it is readily conceivable that in spite of a diminished liberation of energy the actual amount of work may remain the same or even increase, as shown by the observations of Heidenhain already alluded to.

The second supposition, that in the irritated muscle two different chemical processes are simultaneously started by the stimulus, and that then each pursues an independent course, though at first sight contradictory, is really conceivable : for the muscle may preserve a condition of contraction, as in the so-called *contracture*, without appreciable development of heat ; and, on the other hand, the resting muscle even when deprived of its arterial blood supply may increase in temperature.

The conditions under which the muscles contract in the living animal may be so varied by experiment as to permit of study of the influence of rest and fatigue, both with and without the arterial blood supply, and to lead to the hope

that by numerous modifications of the conditions some idea may be formed as to the inter-dependence of heat production and contraction.

To accomplish this comparison of results attained under different conditions, I first subjected the muscle to two successive maximal irritations of one minute's duration ; the first instance being in a fresh muscle deprived of its blood supply, the second with the aorta open.

Since we know that the muscle with normal blood supply surpasses the bloodless muscle both in its power of developing heat and of maintaining contraction, it therefore only still remains to be determined in what proportion, under the influence of the blood, the lift and temperature increase. And since in the normal muscle, through partial dissipation through the blood, the amount of heat developed remains unknown, this can only be accomplished through comparison of the increases of temperature in equal intervals of time ; and as the degree of contraction in both cases does not lie within the same limits, only a mean between these can be used for comparison, a method which is not open to serious objection where the variations are within such narrow limits as in the example reported.

In the following examples the bloodless muscle was always irritated before the normal muscle : the temperature of the muscle was always above that of the blood.

I.

1st Tetanus.—*Circulation Arrested.*
   Temperature increase at end of one minute = 0.36° C.
   Lift at commencement of tetanus = 141 mm. ⎫ Mean Lift =
      "   end   "   = 121 mm. ⎭   131 mm.

2d Tetanus.—*Circulation Normal.*
   Temperature increase at end of one minute = 0.41° C.
   Lift at commencement of tetanus = 140 mm. ⎫ Mean Lift =
      "   end   "   = 130 mm. ⎭   135 mm.
   Relation of temperature of bloodless and normal muscle =
      1:1.14.

Relation of lift of bloodless and normal muscle = 1:1.03.

3d Tetanus.—*Circulation Arrested.*

Temperature increase at end of one minute = 0.28° C.

Lift at commencement of tetanus = 138 mm. ⎱ Mean Lift =
    "   end   "   = 105 mm· ⎰   121 mm.

4th Tetanus.—*Circulation Normal.*

Temperature increase at end of one minute = 0.35° C.

Lift at commencement of tetanus = 134 mm. ⎱ Mean Lift =
    "   end   "   = 111 mm. ⎰   122 mm.

Relation of temperature of bloodless and normal muscle = 1:1.25.

Relation of lift of bloodless and normal muscle = 1:1.00.

II.

1st Tetanus.—*Circulation Arrested.*

Temperature increase at end of one minute = 0.30° C.

Lift at commencement of tetanus = 70 mm. ⎱ Mean Lift =
    "   end   "   = 30 mm. ⎰   50 mm.

2d Tetanus.—*Circulation Normal.*

Temperature increase at end of one minute = 0.46° C.

Lift at commencement of tetanus = 59 mm. ⎱ Mean Lift =
    "   end   "   = 61 mm. ⎰   60 mm.

Relation of temperature of bloodless and normal muscle = 1:1.53.

Relation of lift of bloodless and normal muscle = 1:1.20.

III.

1st Tetanus.—*Circulation Arrested.*

Temperature increase at end of one minute = 0.29° C.

Lift at commencement of tetanus = 86 mm. ⎱ Mean Lift =
    "   end   "   = 55 mm. ⎰   70.5 mm.

2d Tetanus.—*Circulation Normal.*

Temperature increase at end of one minute = 0.37° C.

Lift at commencement of tetanus = 85 mm. ⎱ Mean Lift =
    "   end   "   = 82 mm. ⎰   83.5 mm.

Relation of temperature of bloodless and normal muscle = 1:1.24.

Relation of lift of bloodless and normal muscle = 1:1.18.

If instead of the above quotients of temperature-increase it were possible to estimate the amount of heat developed,

there can be no doubt but that it would be found that the excess of heat production in the normal over the bloodless muscle would be even greater than appears in the above experiments, since my earlier experiments showed that even in the first minutes of muscular contraction the venous blood coming from the muscle is warmer than the arterial supply going to it. Nevertheless, in spite of the unfavorable condition of the calculation it is clear that the resting muscle draws from its arterial blood supply a greater heat-producing than contracting energy.

The experiments above detailed, however, do not yet warrant the conclusion that more heat is developed in normal contracting muscle from the combustion of the matter stored up in its interior during its period of rest than would be the case in equal degrees of contraction in the bloodless muscle ; they, however, indicate the manner in which, to be conclusive, new experiments must be made.

The relation between the temperature and lift of the muscle is, as a rule, inverse, when, instead of a fresh muscle, one already fatigued by prolonged irritation and deprivation of blood supply is again thrown into contraction after renewal of circulation.

Thus, when the capability of producing heat has been greatly reduced by prolonged irritation and repeated closure and opening of the aorta, the reopening of the circulation often produces a marked increase in the energy of the contraction, as shown by a higher lift, with but slight change in the temperature.

The following experiment and curve (fig. 5) will serve to make this clear. During the nine minutes through which the irritation lasted the circulation was at first arrested, then opened, again closed, and finally again opened.

a. Circulation Arrested.

Time after commencement of contraction		$\frac{1}{2}$	1	min.
Muscle temperature	$39.14°$ C	39.37	39.40	
Lift	141	86	11	mm.

b. Circulation Normal.

Time after commencement
of irritation	$1\frac{1}{2}$	2.	$.2\frac{1}{2}$	3	$3\frac{1}{2}$	4	$4\frac{1}{2}$	min.
Blood Temperature	39.12	?	39.29	39.32	39.31	39.30	39.28	
Muscle Temperature	39.43	39.48	39.48	39.44	39.40	39.37	39.37	
Lift	106	109	109	110	110	110		mm.

c. Circulation Arrested.

Time	5	$5\frac{1}{2}$	6	$6\frac{1}{2}$	7	min.
Muscle Temperature	39.37	39.36	39.39	39.41	39.43	
Lift	81	9	8	9		mm.

d. Circulation Normal.

Time	$7\frac{1}{2}$	8	$8\frac{1}{2}$	9	min.
Temperature of blood	39.34	39.39	39.37	39.35	
" " muscle	39.44	39.43	39.40	39.40°	
Lift	9	96		106	mm.

*One Minute after
End of Tetanus.*

Temperature of blood	39.40
" " muscle	39.34

*Three Minutes after
End of Tetanus.*

| Temperature of blood	39.37
" " muscle	39.35
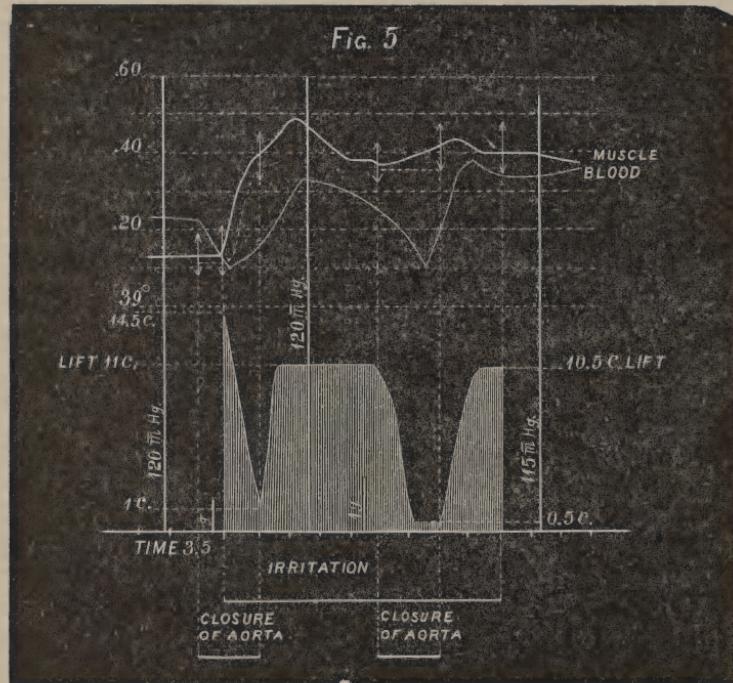
FIG. 5.

In the second period (*b*) of the above experiment the excess of muscle temperature over that of the blood sank in three and a half minutes from $+ 0.31°$ C. to $+ 0.09°$, while the lift increased from 106 mm. to 110 mm.; in the fourth period (*d*) the excess of muscle temperature decreased in two minutes from 0.10° C. to 0.05°, while the lift during the same period increased from 9 mm. to 106 mm. In the second period the average decrease in excess of muscle temperature was 0.06° C. for each minute, and in the fourth period 0.025° C., while after the end of irritation it amounted to 0.03° C.

The results of the above experiments correspond with the conclusions drawn by Heidenhain from investigations made on the excised frog's muscle, but the results which were obtained have not been invariably uniform. Among the deviations, the following experiment furnishes an example : Before the tetanus occurred whose course is here described, the muscle had been already subjected to repeated irritations, although immediately preceding the final contraction it had an interval of rest of ten minutes, during which it was supplied with arterial blood for five minutes, and again deprived of blood for five minutes. It was then tetanized for eleven minutes, among the first three of which the aorta remained closed, and was then opened and remained open to the end of the experiment. The following curve represents the course of the experiment.
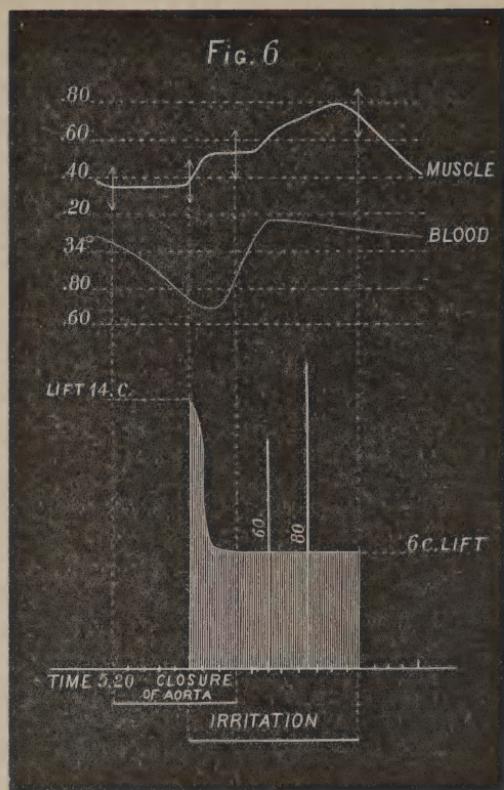
FIG 6.

In the first portion of the experiment, the result coincides with what had previously been found. When, however, the circulation was restored, no increase occurred in the lift, but nevertheless the temperature, after a slight delay, gradually rose 0.23° C. during the following six minutes, or as great an increase as occurred at the commencement of the irritation.

In conclusion I must regret that circumstances prevented my carrying the above study to its completion, but trust that the results above recorded will assist others in extending a subject which must yield most valuable results as to the relations between the blood and the internal vital processes in muscle, and as to the share of the heat production in muscular contraction in maintaining the bodily temperature.

MULTIPLE NEURITIS.*

By S. G. WEBBER, M.D.,

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NEURITIS has lately assumed an importance which formerly was not accorded it. Local traumatic and rheumatic neuritis have been observed many times, and their symptoms have been well described. The grosser and more marked anatomical changes were well known to the profession years ago. The secondary degenerations which arise in the peripheral ends of divided nerves have been known since Waller described them. More recently various trophic changes in the skin have been correctly referred to disease of the nerves.

It is only within a few years that a more general inflammation of the nerves has been recognized. As has frequently happened, the disease had been seen and cases reported at intervals,—in 1864 by Duménil, Lancereaux in 1870 or 1871, and Eichhorst in 1877,—but attention was not specially attracted to the subject until Joffroy in 1879, Leyden in 1880, and Stewart in 1881, had each described cases. Even then it was some months before the possibility of a general diffused neuritis was fully recognized, if indeed it is as yet. In 1882 Caspari published his article "Zur Casuistik der Neuritiden." In 1883 appeared Pierson's "Uber Polyneuritis acuta" (multiple neuritis), an article by Strümpell, one by Vierordt, and another by Müller in the *Archiv für Psychiatrie*, etc.

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* Read before the American Neurological Association, June, 1884.

Up to this time I have found the records of six cases without autopsies and twelve cases with autopsies—one, however, very brief. As so few cases have been reported, the following reports and summary may be of sufficient interest to claim the attention of this Society.

CASE 1.—Thos. McG., æt. twenty-two. Entered Dec. 7, 1883. Was well until one year ago. Since then he has had pains in the abdomen and back, at times lasting several hours, and of a severe darting character. No digestive disturbance. Constipation. Said he had eaten some poorly cooked ham, after which he and others had headache. Nov. 27th he took cold, and Dec. 2d had pains in the legs, and the next day in the arms, a constant aching of the muscles with soreness, worse in the right arm and left leg. Swelling of arms and legs. No pain in back on admission. Chilly and feverish much of the time. Severe headache on Dec. 2d and 3d; dizzy on rising. Vision good; some tinnitus.

On examination it was found that there was tenderness over the biceps on both sides, over the muscles of the right forearm, and over the left radial nerve; not over the other nerves of the arms. Tenderness also over calves and thighs on both sides, over peroneal nerve and sciatics. Both hands and both feet were swollen; no swelling of arms above the wrist, though the patient thought there was. Face was much swollen. There was no special tenderness of the joints, and no swelling of joints, excepting those of the hands and feet, which were included in the general swelling of those parts.

Both arms were contracted in a partially flexed position, the left arm being most contracted. All the muscles below the hips were more or less paralyzed.

Plantar reflex was most marked on the left. Patellar reflex was absent on both sides; no ankle clonus.

Urine was normal in color, acid. Sp. gr. 1025. No albumen; sediment—a large amount of amorphous urates.

Respiratory sounds were normal throughout both lungs.

The faradic reaction was not tested until after the patient had been in hospital several days; then it was found that the tibialis anticus, peronei, and vastus externus on both sides responded feebly even to a strong curve. The rectus femoris and vastus internus did not respond at all. The interossei reacted moderately well; the extensors in forearm, supinator longus and biceps,

reacted scarcely at all ; the triceps, deltoid, and flexors respond-
ed somewhat better. The facial muscles responded with very
nearly the same strength as in health.

The treatment was salicylic acid, iodide of potassium, electricity.
The swelling, pain, contraction, and paralysis gradually yielded,
and after about two months and a half he could get about fairly
well. The œdema reappeared occasionally. The patellar tendon
reflex did not return before he was discharged. At times there
was profuse perspiration. During the first three weeks the tem-
perature was above normal, once reaching 104.5°. After that the
temperature was generally normal. The pulse was almost con-
stantly ninety or above.

April 7th.—He was seen. There was no contracture remaining.
No tenderness of legs or arms. There was absence of patellar
reflex on the left, it was very slight on the right. He considered
himself well and strong.

CASE 2.—I. R. æt twenty-eight, entered the hospital, October
26th. She was well and strong until two months ago. She denied
syphilis ; had done considerable hard work. Two months ago
while at the beach she " took cold " during her catamenia, after
which she began to have pain in the abdomen ; this was followed
by numbness and loss of sensation. There was a girdle sensation
about the waist which later disappeared. No pain in the back.
The numbness gradually passed downwards, leaving the abdomen,
and on entrance was confined to the knees and legs. Occasion-
ally there were sharp pains in the legs, at other times a dead
aching. She could move her legs and feet, but the legs were
slightly flexed at the knees, and attempts to extend them or to sit
up caused feeling of distress about the heart. She was unable to
stand. The pain in the legs was chiefly in the knees, calves, and
feet, and was worse at night. There was a slight numbness in the
hands. There was no headache, nor dizziness; vision was good,
there had been no diplopia ; once a slight tinnitus. Occasionally
a slight cough, pain in chest and dyspnœa ; no palpitation.
Catamenia were regular, not painful, for last two months delayed
three or four days. Appetite and digestion were good, bowels
regular, micturition normal.

Nothing abnormal was found in lungs or heart. There was
general tenderness over the muscles of the legs and thighs, and in
the arms near the wrist, and over the popliteal and sciatic nerves.
There was diminution of tactile sensation in the left leg as com-
pared with the right. The plantar reflex was fairly good ; patel-
lar tendon reflex was absent on both sides.

To the faradic current on the right, the tibialis anticus acted fairly well, the peroneus, rectus femoris, vastus internus, and gastrocnemius not quite so well. On the left, the tibialis anticus acted best, the rectus femoris gave scarcely any reaction, the gastrocnemius also responded very sluggishly.

With the galvanic current on the right the tibialis anticus responded readily and gave a quick contraction to fourteen cells; the peroneus gave a slow but strong contraction to twelve cells ; the gastrocnemius responded very sluggishly to sixteen cells. Very nearly the same reactions were obtained on the left.

The pain and tenderness increased in the legs and extended to the upper extremities, the nails and ends of the fingers being first affected. There was tenderness over all the larger nerve-trunks in both arms.

At one time the cough had a barking sound and seemed to be somewhat hysterical in character.

The treatment was salicylic acid, ten to twelve grains every three hours ; blisters over tender nerves in the arms ; morphia to relieve pain ; five-per-cent. solution carbolic acid on compresses over painful muscles. This last application gave considerable relief to the pain.

Nov. 16th.—Most of the pain had left the legs and fingers ; the fingers were anæsthetic, their ends tender on pressure ; pressure to calves also caused pain. The tenderness had disappeared from over the ulnar and radial nerve, was still considerable over the median and popliteal on both sides, slight over the left sciatic.

Nov. 21st.—The pain was entirely gone from the legs and arms, but the legs were still partially flexed and could not be extended without pain.

Jan. 19, 1884.—Tenderness was quite gone from the fingers, except the forefingers. The grasp of the hands was of moderate strength and the same on both sides. The calves of both legs were still tender. The peroneus did not respond to the faradic current on either side. The gastrocnemii and recti femoris required strong currents. The vastus internus did not respond on the left ; it required a strong current on the right.

There was contraction of the flexor muscles of the legs, so that the legs were bent at nearly right angles to the thighs ; the feet were also in extension and an effort to rectify the position of either the legs or feet caused considerable pain. By means of massage, extension by weights, by elastic bands, and with the aid of electricity the vicious positions were rectified.

Five months after admission she was able to walk with assistance, the heels did not touch the floor in standing, and she could not stand upright, stooping forward. The calves were still tender to pressure, and there was tenderness over the popliteal nerve ; patellar tendon reflex was absent.

A month later she was able to walk without assistance and helped in the work of the ward.

Case 3.—Caroline M., æt. thirty-four. Was received Jan. 18, 1884, with a family history of consumption. She was said to have had rheumatism for several years ; and for a long time had had palpitation and dyspnœa. Had been somewhat addicted to the use of alcohol. No cough, micturition normal. Cata. regular. She had had an attack of vomiting three months previous to present illness.

In the earlier part of illness, which began about four weeks before entrance, there were pain and numbness in the legs ; this improved somewhat, then the pain returned. There was no disturbance of motion excepting as explained by the pain. This account was given from recollection by her physician after her death.

On admission she complained much of pain, chiefly in the joints and back, which had troubled her for three weeks ; was unable to turn herself in bed on account of pain ; she could not bear to have the ends of the fingers touched. She perspired profusely ; was delirious.

Tenderness over forearms, most marked on right ; over median nerve on left, median and ulnar nerves on right, and over right clavicle. The calves were also tender, as well as the popliteal and sciatic nerves in legs. Entire paralysis of hands and fingers, legs and feet, and perhaps of thighs. Anæsthesia to pricking and touch in left leg and thighs. Œdema of ankles, feet, legs, and hands. Absence of patellar tendon reflex and plantar reflex. She says that occasionally she chokes on swallowing, but at visit swallowed without difficulty. Voice seemed to be changed but was not nasal. The pain seemed to become less severe ; at seven P.M., Jan. 19th, she died. No autopsy.

Case 4.—Mary N., entered the City Hospital Nov. 13th ; no special family tendencies ; no severe illness. Three years ago had a bubo in groin, and husband had gonorrhœa at the same time. Had two children ; no miscarriages ; first child died at four months of age ; had indulged in excessive use of alcohol, and four weeks before entrance had drunk much, and had a severe

attack of vomiting lasting two days, was delirious three or four days, and saw all sorts of things. For some days before entrance, how long is not mentioned in the records, she had slept poorly on account of dull aching pains in lower extremities ; had numbness in hands and forearms. The pain in limbs became severe, she could not turn over in bed without assistance, her knees were drawn up, and attempts to straighten the legs caused severe pain. There was loss of power in extensors of the wrist and hands, and the fingers could not be shut perfectly. There was general tenderness over the muscles of the extremities. Pressure on right over the radial, median, and ulnar nerves, on the left over the median, caused much pain. In the legs pressure was painful over the popliteal, sciatic, and crural nerves on both sides. The voice was hoarse, and she complained of sore throat ; the fauces were of a rather deeper purple tint than normal. Her general appearance indicated so much suffering that a complete examination was not made. Inquiries as to a sore throat previous to admission, and as to the possibility of diphtheria, showed that she had not suffered from any such disease.

Two or three days later it is noted that there was considerable anæsthesia of fingers and feet ; no patellar tendon reflex. The pain was so severe that morphia was given to control it. The paralysis became more complete, the anæsthesia increased, the pain was rather less, or was controlled by the morphia. The voice was reduced to a whisper, and even whispering necessitated great exertion. Urine and fæces passed involuntarily.

Nov. 28th.—There was considerable difficulty in breathing, respiration rapid ; less pain, much thirst ; was said to swallow perfectly well. Air entered the apex of right lung less readily than the left ; an occasional râle was heard ; percussion resonance not so good on right. Respiration was accomplished by means of the upper ribs and the accessory muscles ; there was paralysis of the diaphragm. The respiratory murmur could not be heard lower than the lower edge of the sixth rib. She died seventeen days after entrance.

Autopsy seventy-two hours after death by Dr. Gannett. The lungs showed on section small nodules, grayish and granular, denser than the lung substance. These nodules, about the size of a pin's head, could be felt by pressure from without. On pressure of cut surface, numerous points of pus were to be seen. The bronchial mucous membrane, as well as that of the larynx, trachea, and pharynx, was covered with a puriform fluid. The kidneys

were congested, and there was acute purulent pyelo-nephritis. On section of the liver the central parts of the acini were distinct as brownish areas one mm. in diameter ; the peripheral parts were opaque reddish gray. The miscroscope showed central fatty infiltration, pigmentation, and cloudiness of cells of remaining portion.

The brain and spinal cord seemed to be healthy, both externally and on section.

The brachial plexus on both sides with their larger branches as far as the wrist, the sciatics with branches as far as the heel, the crurals as far as the knee, the phrenics, and vagi, were removed.

These various nerves showed nothing abnormal in their gross appearance ; there was no enlargement nor undue redness.

Microscopic Examination.—Numerous sections of the cord were made in various parts, chiefly at the cervical and lumbar enlargement ; more than a hundred were carefully examined. The cells of the anterior cornua showed no variation from the normal in number nor in character ; the white and gray substance seemed to be healthy ; there was no undue injection nor disease of the blood-vessels.

Portions of the nerves were put into a $\frac{2}{5}$-% solution of osmic acid for twenty-four hours, were then placed in a solution of picro-carmine for two days, then placed in glycerine until they could be examined. The parts thus treated were the upper part of both brachial plexuses ; the distal ends of the median, ulnar, and radial on both sides ; the lower end of the longest branch of both sciatic systems, from near the heel ; the right pneumogastric and right recurrent laryngeal ; the small portion of the pneumogastric from near the stomach ; the upper part of the right phrenic. (The rest of the phrenic had been removed with the thoracic viscera, and could not be obtained.) Except the phrenic, and that part of the pneumogastric from near the stomach, and the upper parts of the brachial plexus, every nerve thus examined was much diseased. The lower ends of the sciatic system were most extensively diseased. The recurrent laryngeal and the vagus, just below where it is given off, were least affected. In one brachial plexus, among many specimens examined, one degenerated nerve fibre was found ; in these specimens from the brachial plexuses were found some fibres which seemed to be in the very first stage of inflammation, but most of the fibres were healthy. The distal ends of the median, ulnar, and radial on both sides were much diseased, but less so than the nerves from the leg.

The portions of nerve not placed in the osmic acid were put into Müller's fluid.

The simplest change found was in the medullary sheath at Ranvier's constrictions, without break in the axis, and, so far as I could judge, without increase of nuclei.
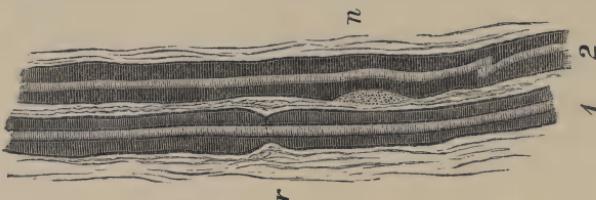

FIG. 1.—Healthy nerve fibres, osmic acid preparation. *r*, constriction of Ranvier; *n*, nucleus. The axis cylinder is bent on itself in one place.

The changes in the distal ends of the nerves were very similar or identical with what is found in secondary degeneration after section of a nerve. The medullary sheath was divided into fragments of greater or less extent ; the axis-cylinder was discontinuous or destroyed, remaining when the medullary sheath was only slightly changed. The fragments of the medullary sheath were finally reduced to very small granular débris, and much of this
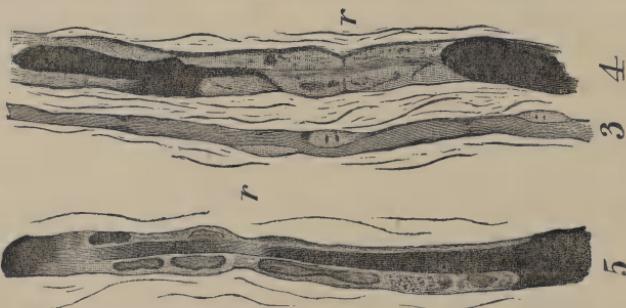
FIG. 2.—At 3 a thin fibre, with three nuclei in or adherent to it ; at 4 and 5 inflammatory changes just beginning in the medullary sheath at the annular constrictions *r*.

was absorbed. In the fibres which were most altered was found an increase of nuclei ; and apparently small masses of protoplasm, not nuclei, were tinted in the midst of the granular débris.

On cross-section of portions hardened in Müller's fluid and tinted with carmine, the distal ends, especially of the branches of the sciatic, showed almost no nerve fibres with axis-cylinders ; the sheath was either filled with granular material or had collapsed. There were many small masses, either of fibres or nuclei, which were tinted almost uniformly a deep red. Nearer the root of the
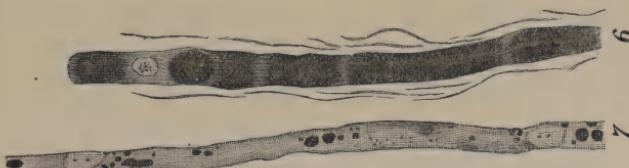
FIG. 3. The first segmentation of secondary degeneration at 6; extreme degree of this degeneration, only a few points or dots of myeline showing, 7.

nerves, axis-cylinders were more numerous, and specimens yet nearer the origin showed a large preponderance of healthy nerve fibres. In the sciatic the sections from the highest part of the nerve which had been preserved were still diseased in a small proportion of their fibres.
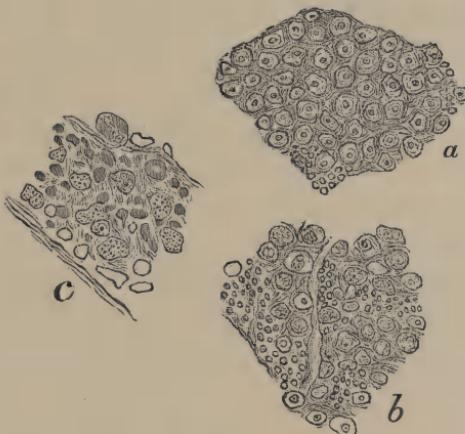

FIG. 4.—Transverse sections of nerve hardened in Müller's fluid, stained with carmine. *a*, nearly healthy from brachial plexus; *b*, much diseased from radial; *c*, extreme degeneration from sciatic.

These few cases are sufficient as examples of this disease. It happened that during the fall and winter of '83–'84, an unusually large number of cases of multiple neuritis entered the City Hospital—eighteen. I saw one in private practice, and a second in which the diagnosis was somewhat doubtful, between neuritis and infantile paralysis. Fourteen of those at the City Hospital came under my observation, nine of these on their entrance, five as remaining when I took the service from Dr. Denny.

Of all the patients the youngest was nine years old (a private patient). This is the only child in the list. The oldest was fifty-one years. More than half were between twenty and thirty years of age.

Where the commencement of the disease could be fixed with any degree of certainty, there was an interval of from one week to four months before the patient entered the hospital. The stay in hospital varied from two days (patient died) to six months; three or four months in most cases, and even after four months' stay only a few patients left the hospital able to engage in their usual occupations; generally there was still great weakness of the limbs.

In most cases no cause could be given for the disease; in five cases exposure to wet and cold, " catching cold," was thought by the patient to be the cause of his sickness.

Nine were females. Ten were males.

There were three deaths: two of the cases in which death occurred have been reported.

Disturbance of sensation is one of the most constant and prominent symptoms. A tingling or " sleepy " feeling may precede the more severe pain; within a comparatively short time the pain becomes severe; it is confined to one nerve district or may extend to several; sometimes the patient can mark the course of the nerve by the pain. The character of the pain, aching, boring, shooting, burning, varies in different cases. With the pain there is great hyperæsthesia of the skin and tenderness of the muscles, pressure causing excessive pain. Pressure over the nerve trunks gives rise to more acute pain than when it is applied to the muscles.

When the hyperæsthesia has subsided sufficiently there will be found diminution of tactile and other sensations. The special senses have only rarely been found affected.

Exceptionally the pain and tenderness have been very slight or wanting.

Motion is early disturbed, at first a stiffness, in part due to pain; later paralysis, more or less complete. The muscles are not affected equally, but the paralysis is distributed according to the nerves attacked.

Within a comparatively short time the limbs are contracted, semi-flexed, and sometimes the contraction may become extreme, the heels may be drawn up to the thighs, and the knees nearly to the chest.

The electrical reactions of the muscles and nerves show the changes due to their respective degeneration.

A careful examination of the reflexes, deep and superficial, was made by Dr. Knapp, house officer at the hospital. He found that the various tendon reflexes were generally absent, the patellar tendon reflex being slightly marked in only two out of thirteen patients; the radial and ulnar periosteal reflexes were present in only one or two patients.

The cutaneous reflexes were less disturbed. The plantar reflex was present in eight patients, in two of these rather exaggerated; was absent in five. The cremaster reflex was present in five out of eight males; the abdominal reflex was present in four, absent in nine.

In four other patients not examined by Dr. Knapp, I found the patellar tendon reflex absent; the plantar reflex was also absent in three.

The temperature and pulse were rather elevated in the earlier stages of the disease, and in the two fatal cases throughout the period when they were under observation. Later the temperature dropped nearly or quite to the normal, but the pulse rate continued rather high.

In a few cases a mild delirium was noticed, most marked at night; in one or two women there seemed an hysterical disposition, but neither the delirium nor hysteria were of more than secondary importance.

There was atrophy of the muscles, and in some patients great general wasting of tissue and loss of flesh.

In other patients there was œdema of the limbs and even of the face ; this œdema in case 1 affected the hands and feet, in case 3 was more general, and might have led to doubt as to diagnosis, simulating rheumatism.

Excessive sweating was observed in some of the patients, in this respect also simulating rheumatism.

After several weeks' continuance of the disease the skin of the fingers in one patient assumed the glossy appearance peculiar to the trophic disturbance seen in some nerve lesions.

One patient had abscesses in the parotid region during convalescence.

The disease began most frequently in the legs, was sometimes confined to them, but often extended to the arms. In fatal cases its progress was rapid, the respiratory muscles became paralyzed, the respiration was diaphragmatic just before death ; the voice was affected. and deglutition was abnormal; the patient died of apnœa, or in case 4, perhaps also from the entrance of food into the lungs. In case 4 death occurred seventeen days after entrance. Case 3 had been sick about four weeks before entrance, though the report is not entirely clear, as she seems to have improved at one time and then became worse again.

Now that the peculiar symptoms of multiple neuritis have been clearly pointed out, the diagnosis is not difficult in well-marked cases, but in light cases might be difficult.

It is to be diagnosticated from anterior poliomyelitis by the .pain and hyperæsthesia, the tenderness over nerve trunks, the diminution of sensation, the high pulse rate ; by its more gradual onset from the acute form of poliomyelitis ; it is less common for the latter to invade all four extremities.

Progressive muscular atrophy does not have the sensory disturbances; the electrical changes are not the same.

In lead-paralysis also the sensory disturbances are usually less marked, and the progress is slower.

Multiple neuritis may be mistaken for rheumatic fever, and when there are œdema of the limbs and profuse sweating, as in the first and third cases, there may be reason for making such a mistake. The course of the disease would soon show the mistake. Spinal meningitis will be recognized by the greater amount of pain in the back, by passive motion increasing this pain, by the spasm if present, and by the absence of other peculiarities of neuritis.

Déjérine (Étude sur le névro-tabes périphérique—ataxie locomotrice par névrites périphériques, avec intégrité absolue des racines postérieurs, des ganglions spinaux et de la mœlle épinière—*Arch. de Physiol.*, 1884, p. 231) has recently reported a case which was supposed to be locomotor ataxia, where after death no other lesion than neuritis of the peripheral nerves was found.

The disease known in Japan as *kak-ke* has been described by Scheube, who has carefully examined the nervous system in twenty patients. He found neuritis in every case; slight lesion of the cord, not sufficient to explain the symptoms, in only one case. He believes a specific poison is the cause of the disease.

Recently Dr. J. B. de Lacerda has published a monograph (see *Science*, March 14, 1884, p. 331. Etiologia e genesis de beri-beri. Pelo Dr. J. B. de Lacerda. Rio de Janeiro, 1884), in which he claims to have discovered the bacillus of beri-beri, and by injecting liquid containing this bacillus into rabbits and Guinea-pigs he produced a similar disease. He also found similar bacilli in rice, and cultivating he produced the organisms, and injecting these into animals produced the disease.

The nature of the pathological process in these cases was generally believed to be an inflammation of the nerves. But at a meeting of the Section for Psychiatry and Neurology of the Versammlung deutscher Naturforscher und Aerzte in Freiburg, held last Sept., Erb made two suggestions (*Allgemeine Zeitsch. f. Psych.*, etc., xl., 1884, p. 834), which he thought deserved more consideration:

" 1. It is possible and probable that purely functional disturbances of the trophic centres in the spinal cord produce anatomical disturbances (degenerative atrophy) in the periphery (the motor nerves and muscles).

" 2. It is possible that besides the complete destruction and separation of the trophic centres, yet other pathological processes occur in them which need not always go so far as to show themselves in the form of total degenerative atrophy of the peripheral regions of these centres."

These suppositions seem to have been answered sufficiently at that meeting by Strümpell, Schultze, and Seeligmüller, who show that Erb's hypotheses are less likely to be correct than that which refers the lesion to a peripheral neuritis. Erb replies that his hypothesis is only met by an hypothesis.

In the case just reported the degeneration in the peripheral ends is simply the degeneration due to the separation of a nerve from its trophic centre, the Wallerian degeneration (fig. 4 shows the first segmentation, fig. 5 shows the extreme degree of change). As specimens from nearer the origin of the nerves, this degeneration was less marked, and a larger number of healthy nerve fibres appeared. In those taken from the brachial plexus the nerves show change only about the constrictions of Ranvier. The first change is not segmentation, but a disturbance of the medullary sheath at these points (figs. 2 and 3).

The same change was seen in a specimen from a Guinea-

pig, where the nerve was in the first stage of inflammation.

Gombault (*Archives de Néurologie*, t. I., 1880, pp. 11–177) has studied the changes in neuritis produced artificially in Guinea-pigs by mixing lead with their food. He finds that the seat of commencing change in the segments of a nerve fibre is at the end of the segment, the axis-cylinder remaining intact. He concludes that the difference between inflammation and Wallerian degeneration is: (1) that in the same nerve fibre the lesion is discontinuous, it attacks certain inter-annular segments to the exclusion of the others; (2) the axis-cylinder is not interrupted, the myeline sheath and protoplasm are alone affected. It is a true parenchymatous inflammation; it may terminate in restoration of the fibre, or the axis-cylinder may be at length destroyed, and then the Wallerian degeneration follows in the distal end of the nerve fibre.

Gombault thinks this peri-axillary neuritis does not have its origin in a change of trophic action of the spinal centres.

Considering the changes found about the annular constrictions, it is reasonable to consider the disease a neuritis, not dependent upon changes in the spinal cord. The fact that the distal extremities of the nerves were most affected, and the change diminished toward the spinal centres and ceased in some nerves long before the spinal cord was reached, would also lead to the conclusion that the disease was not dependent upon changes in the cord.

In most cases the patients recovered more or less completely, but recovery was very slow in severe cases. It required much time and patience to straighten the contracted limbs, and strength was regained very gradually.

I am not sure that any treatment shortened the attack. Salicylic acid seemed to cut short the pain in some cases, and when it returned it was not quite so severe. It was necessary to give morphia to relieve pain. A 4 % to 5 %

solution of carbolic acid applied on cloths to the painful limbs was of decided advantage. One patient thought ice to the spine grateful, another preferred hot water, complaining that ice increased the pain in the limbs. Blisters over nerves seemed to be of advantage in one or two cases where used, especially in a case where the hyperæsthesia was very persistent.

It is well to try to avoid or diminish the extent of the contractions by position or gentle extension of the limbs, a sand-bag to rest the feet against, etc., for the contractions are difficult to overcome. To do so requires a persevering use of massage, extension, and electricity. These agents are to be used a long time to promote a return of power.

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CARCINOMA OF THE PERITONEUM.

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MOST malignant new-formations of the peritoneum are carcinomatous. Those of other nature are usually secondary, either by continuity or metastasis. Enchondroma has been thus observed, exhibiting a feature of malignancy unusual, though not without precedent (Wood, *Lancet*, 1881, i., 249). Myxo-sarcoma and sarcoma have also been encountered, both as primary and as secondary growths. Primary peritoneal sarcoma has been reported by Kelsch and Wannenbroncq,[1] Berlioz,[2] Weiss,[3] and others.

Carcinoma of the peritoneum may be primary or secondary. Of late years there has been not a little confusion concerning primary carcinoma of the peritoneum. From time to time peritoneal carcinoma has been observed where every evidence of its primary development was present at the necropsy. At the same time the impossibility of such occurrence continued to be urged by the upholders of the germinal lamina theory of tumor formation, by whom it has been insisted that carcinoma, a new-growth dependent for at least a portion of its structure upon tissues derived directly from the epiblastic layer of the blastoderm, could not be developed from the peritoneum, a purely mesoblastic structure.

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[1] *Prog. méd.*, ix., 1881, 729.
[2] *Jour. de la soc. de méd.*, etc., *de l'Isère*, 1879, 89.
[3] *Aertz. Berl. d. k. k. Allg. Krankenh, zu Prag.*, 1882, 128.

Various explanations of the apparent existence of primary cancer of this membrane have been offered. Some have assumed it to be really secondary to primary undetected formations in epithelial structures. Klebs suggested an infection of the peritoneum with epithelial elements, rather than by a carcinomatous new-growth originating in the peritoneal endothelium, leaving to future investigation the task of determining the route by which the epithelial elements are brought to the peritoneum.[1] These pathological difficulties have, fortunately, been greatly relieved by recent embryological discoveries, whereby practical experience may be reconciled with the prevailing theory. The investigations of Hertwig and Balfour show that the lining membrane of the peritoneum is derived from the hypoblast, and that it is, therefore, a true epithelial structure.[2] There is, therefore, no difficulty in concluding that carcinoma not only may but does occur as a primary peritoneal new-formation.

Varieties of Peritoneal Carcinoma.—The cellular elements predominate in proportion to the rapidity of growth of peritoneal cancer. In the most rapidly fatal varieties the growth may have the softness of brain substance. Acute miliary carcinoma is probably always medullary. In less acute primary carcinoma both this and the fibrous (scirrhous) and colloid forms occur. The connective-tissue element will be most abundant in the slower forms and hard leathery bands of malignant infiltration will be developed. Colloid cancer, usually indicative of a more chronic course, may complicate both the medullary and scirrhous forms. Petrina[3] records forty cases of peritoneal carcinoma. Of these fourteen were primary, nine medullary, and five scirrhous (fibrous); twenty-six were secondary—fourteen medullary, ten scirrhous, two colloid. Chuquet[4] found that of the cases collected by him,

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[1] *Handb. d. path. Anat.*, 2d part, 1869, p. 337.
[2] Ziegler's "Path. Anat.," part 2. Translated by McAllister. Lond., p. 123.
[3] *Viertelj. f. d. prak. Heilk.* Prag., 1872, 2 B., 541.
[4] "Thèse de Paris," No, 548, 1879.

two thirds were primary. (He also found colloid carcinoma
to be the most frequent. It is more correct to speak of this
as a degenerative condition of cancer than as a distinct va-
riety, and to apply the term colloid cancer only when the
colloid change is predominating. To a limited extent it can
be discovered in a large proportion of carcinomas.) Carci-
noma may affect the peritoneum secondarily by continuity
from other organs or tissues, and by metastasis. Melanotic
cancer may thus rarely develop.

Symptoms and Course.—Primary peritoneal cancer may de-
velop very insidiously, and has an indefinite and irregular
course. Pain commonly first attracts the attention of the
patient. This may become nearly constant or paroxysmal,
most intense in some fixed region, and radiating thence
to other parts of the abdominal cavity, or to the chest,
shoulders, or back, or down the thighs. It is variously de-
scribed as stabbing, stinging, burning, or as a dull, heavy
sensation. As a rule it gradually increases in severity until
it becomes a source of unending distress or even agony. It
may, however, not be present during the earlier stages, or
may never acquire especial prominence. This pain is, at
first, not aggravated by pressure, and it is probable that
the tenderness so often observed later may usually be attrib-
uted to peritonitis. About the period of development of
pain, or sometimes even earlier than this, the patient
realizes that he is not well. Vague disturbances of his di-
gestive organs, anorexia, even disgust for food, and other
signs of gastric indigestion, will appear with eructations,
flatulence, etc. Vomiting may occur at this time, but more
commonly when the disease is advanced, and is then often
a result of peritonitis. At other times it follows primary
cardiac or pyloric gastric cancer, of which the peritoneal
growths are secondary results. Constipation will gradually
become persistent and the patient will lose strength and

flesh. At this time there will be no fever except in the more acute cases, and the thoracic organs will be unaffected, unless involved in a general carcinosis or subject to independent disease. In acute miliary carcinosis fever may be present from the first and the case closely resemble one of acute miliary tuberculosis.

Sooner or later the belly will become enlarged from the growth of the tumors, from meteorism, from ascites, or a combination of these conditions. In a large number of cases the tumors may be obscurely felt as nodules, varying in size from that of a nut to that of a child's head, deeply in the abdominal wall or more profoundly situated. At times the nodules are replaced by tracts of resistant matter not clearly definable, or by the hardened cancerous omentum crossing the belly as a broad band of induration. When felt, the tumors will usually be hard and resistant, except in the case of colloid cancer, when an obscure sensation of fluctuation may be perceived. Examination by the vagina and rectum will often assist the observer by revealing the infiltrations in the pelvic cavity. Not unfrequently the uterus will be immovably fixed in a mass of such material. The new-formations will often grow rapidly. It is uncommon, however, for them to be easily and definitely recognizable unless of large size, since they are obscured by ascitic fluid and by gas within the intestines. The occurrence of peritonitis will also tend to make a diagnosis difficult by forming adhesions whereby pockets of fluid and knuckles of intestines become fixed in various positions. The surface of the belly will thus be made uneven by the irregular distribution of cancer masses, localized meteorism, and encysted fluid. In the more acute forms it is not at all uncommon for the carcinomatous nodules to entirely escape recognition on account of their small size and wide distribution and the accumulation of ascitic fluid, and the

true nature of the disease may not be determined *intra vitam.*

Chuquet claims that a symptom of highest diagnostic importance is the presence throughout the entire subcutaneous system and in the muscles, of " cancer granules " first described by Millard, and which are said to be perceptible to the touch. These " granules," however, do not seem to have been met with by other observers, and can therefore hardly be counted upon with confidence. What seems to be a somewhat similar condition has been described by Chvostek as a scattered crepitation over the belly in peritoneal cancer, or even in peritonitis, quite like skin emphysema. He attributed the sign to fluid enclosed in very small spaces with delicate and sharply limited walls, and which is forced out by pressure. He found it only where the abdominal viscera were adherent to the anterior belly-wall by peritonitic products containing fluid in very small cavities.[1]

Ascites is constantly present in these cases. It is due to peritonitis or to pressure exerted upon venous trunks within the belly cavity, or to hydræmia. It may vary in amount from one to twenty or thirty pints. The fluid is usually clear and of high specific gravity, with floating shreds of fibrin. Its character will often be ascertained through paracentesis performed for the relief of pain or for purposes of diagnosis. It will then be found, very often, to be tinged with blood or decidedly sanguinolent. This condition of the ascitic fluid is of the highest diagnostic importance, and has been insisted upon by a number of writers as indicating a strong probability of a cancerous origin. It must be admitted, however, that it is *possible* for this fluid to be sanguinolent in tubercular and even in chronic peritonitis. All things considered, sanguinolent ascitic fluid gives a strong presumption in favor of perito-

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[1] *Œsterreich. Zettsch. f. prakt. Heilk.*, 39, 1866.

neal cancer; and if the sedimentary deposit of this fluid be microscopically examined (a procedure first recommended by Foulis, of Edinburgh), the detection of groups of ordinary epithelial cells will serve to determine its cancerous origin.[1] The amount of fluid is not always proportionate to the duration of the affection. It is often irregularly distributed, by reason of the frequent peritoneal adhesions, which also bind the intestines in such a manner that the usual position of these in simple ascites is not often observed. Another rare peculiarity of the ascitic fluid of carcinoma has been observed by Quinecke, Klebs, and Brieger. Here the fluid is milky white, and forms a creamy surface layer of fat-corpuscles and granular fat. Such cases have been supposed to represent chylous ascites. Brieger, however, thinks that there is no escape of lymph, but that the appearances are due to fatty degeneration of peritoneal epithelium. After paracentesis, peritoneal friction sounds may sometimes be heard. General dropsy frequently occurs later, though œdema of the lower extremities has been known to precede ascites. Pericardial and pleural effusions may arise from cancerous metastasis or extension, and the abdominal wall may become œdematous. Œdema of the lower extremities from pressure upon large intra-abdominal veins may become very intense, and may lead to erythematous, erysipelatous, or even gangrenous inflammation. When pressure is exerted upon the ascending vena cava, the veins of the abdominal wall become very large and tortuous, with reversed blood-current.

It has been said that constipation is nearly always present early in the disease. This will be associated with more or less localized meteorism. These accumulations of gas sometimes press the diaphragm above its natural limits, and add greatly to the general discomfort. Attacks of

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[1] Beatson, *Glasgow Med. Jour.*, 12, 1879; Chuquet, *loc. cit.;* Brieger, *Charité-Annalen* viii, 1883, 109.

diarrhœa may alternate with constipation, and toward the end diarrhœa may become persistent. On the other hand, the lumen of the bowel may ultimately be destroyed, and the patient perish with the symptoms of obstruction. Hepatic and urinary disorders, as direct results of the carcinoma, are not constant. Jaundice may be occasioned by pressure of the new-growths upon the bile-ducts. The renal functions are not often disturbed. The urine will often be highly acid and deposit urates freely. Micturition may sometimes be painful and frequent from implication of the bladder.

While these symptoms are developing, the patient's general condition becomes markedly worse. In a short time, possibly several weeks, more often several months, the various disturbances of nutrition, together with the rapid increase in number and size of the cancerous growths, will have induced that peculiar condition known as the cancerous cachexia, which will, of itself, often direct attention to the true nature of the disease in obscure cases. Tenderness to pressure will be superadded to the ever-increasing distress. Rapid emaciation and increasing debility result from diminished assimilation, pain, sleeplessnes, and general discomfort. The inguinal glands may become enlarged and indurated, and metastatic deposits may occur in other parts of the body. Cancerous infection of the tract of puncture of paracentesis has been observed by Brieger, Reinke, Quincke, Unverricht, and Chuquet. Fever, which may have been present from a very early period, will sooner or later appear and become constant. Pain, insomnia, nausea and vomiting, alternating constipation and diarrhœa, profound debility combine to intensify the sufferings of the patient until death occurs, from the development of the cachexia, from pulmonary œdema, pneumonia, perforation of the bowels, peritonitis, hemorrhage, or some intercurrent affection.

When the peritoneal carcinoma originates through continuity or metastasis, its symptoms will blend with those of the primary affection, and will often play a *rôle* quite unimportant ; or it may become diffused with great rapidity. In such cases, of course, the symptoms of the primary disorder will not be mitigated by the involvement of the peritoneum, but may be less sharply defined than when uncomplicated with those of secondary formations.

Duration and Prognosis.—Peritoneal carcinoma probably runs its course more rapidly than any other form of cancer, ending fatally in from four to six months. Rarely cases terminate within a few weeks after the *apparent* beginning of the malady. On the other hand, life may be prolonged for a year or eighteen months. Vidal reported a case that lasted two and a half years (Chuquet). This seems to be the extreme. Petrina gives the medium duration of primary peritoneal carcinoma, reckoning from the earliest fever, as six weeks, and of secondary cancer as from one to three months. The shortest course observed by him in primary carcinoma was one week ; the longest, six months ; and in secondary cancer the shortest duration was three weeks ; the longest, eighteen months. Other authorities give a longer average duration to the disease, though all agree that the fatal termination will generally come within six months.

Etiology.—This is very obscure. Traumatism has been ascribed as an occasional cause of primary carcinoma of the peritoneum, but this is very doubtful. Probably, also, chronic peritonitis rather occurs as a consequence than as a cause of the new-formation. Heredity exerts a positive but indeterminate influence. Although there seems to be no time of life at which peritoneal cancer may not occur, it is prone to appear after middle life. It has been observed in infancy and even in the fœtus. The following tables of

Petrina and Chuquet show the ages of the patients recorded by them.

	PETRINA.		CHUQUET.	
Age.	*Male.*	*Female.*	*Cases.*	*Total.*
10–20	—	1	1	2
20–30	1	2	9	12
30–40	—	2	5	7
40–50	6	2	4	12
50–60	4	7	13	24
60–70	3	7	4	14
70–80	2	3	5	10
	16	24	41	81

It thus appears that nearly one third of all cases occurred between the ages of fifty and sixty, and three fourths of all after the fortieth year. Sex has a decided influence, females having a much greater liability. Of Petrina's forty cases, sixteen were males and twenty-four females. Chuquet records the sex of forty-four cases, of whom seventeen were males and twenty-seven females. The greater liability of females is probably due to the comparative frequency of cancer of the female genital organs, and its extension to the peritoneum. Secondary cancer arises by extension or metastasis from other parts or organs. Chuquet concludes that the centres most often the seat of the primary deposits, are, in order of frequency, ovaries, stomach, liver, and uterus. Petrina's tables show, however, the stomach and pylorus to be the most frequent primary centres of twenty-nine cases of secondary peritoneal cancer, the stomach and pylorus were primarily affected in seventeen, the ovaries, Fallopian tubes, and uterus in four, the liver in three, the pancreas in two, the mesenteric and retroperitoneal glands in two.

Diagnosis.—This is frequently of extreme difficulty, especially in primary carcimoma ; indeed in rapidly fatal cases

the nature of the disease may be only determinable after death. At best, the earlier stages usually escape recognition. The affections most apt to be confounded with peritoneal cancer are peritoneal tuberculosis, cancerous and other tumors of the abdominal viscera, ascites from cirrhosis, hydatid and ovarian cysts, meteorism and impacted fæces. When the malady is secondary it is not usually difficult to attribute the new symptoms to their true cause. Their appearance, more or less complete, in a person known to have gastric, ovarian, hepatic, or other variety of cancer, will readily be recognized as indicating an extension or metastasis. Cancer secondary to undetected primary growths will not differ from primary forms in the difficulties of its recognition. Tubercular peritonitis may present the closest clinical analogies with rapid peritoneal carcinoma. There may be the same early development of ascites, the rapid wasting and debility, the abdominal pain, even the formation of tubercular masses detectable through the abdominal wall. Diffusion of nodules to other serous membranes may occur in both affections. Carcinoma, however, may be, indeed, is often quite devoid of fever, which, when present, is quite irregular and unlike the fever of tuberculosis, the evening exacerbations of which are characteristic. The ascites of cancer is more abundant than that of tuberculosis, though in both affections the fluid may be irregularly encysted through inflammatory adhesions. Although pain is present in tuberculosis, it is altogether less than in cancer where it seems often quite out of proportion to the amount of appreciable disease. The existence of tubercle in other organs and the presence of persistent diarrhœa, should give a prejudice in favor of similar disease of the peritoneum. This, however, should not be held too rigidly. Cancerous tumors of the stomach and liver are usually unaccompanied by ascites, unless the peritoneum becomes in-

volved, or secondary deposits occur, compressing the vena portæ or ascending vena cava. In the latter case œdema of the lower extremities will also be present. Hepatic cancer will also show the influence of the diaphragm in following the respiratory movements. Sarcomatous tumors of the peritoneum or intra-abdominal organs, or of the retro-peritoneal glands, do not afford well marked clinical differences with carcinoma. Simple tumors are to be distinguished by their benign course. Ascites from hepatic cirrhosis is of more chronic course, is more painless, and presents altogether a different clinical history.

The apparent cachexia of cirrhotic patients may at times be misleading; but the symptoms of hepatic contraction will be present, and the absence of tumors may be ascertained through paracentesis. Hydatid and ovarian cysts have a slower development and a localized development of fluctuation. They are, also, usually painless, unless complicated with peritonitis. The hydatid thrill, when present, will assist the diagnosis. It should not be forgotten that ovarian cysts are sometimes associated with carcinoma.

Meteorism may distend the belly-wall, but the pure tympanites, and its dispersion under appropriate treatment, will distinguish it. Also, fæcal accumulations may be recognized by their plasticity, and their removal by proper purgation.

The presence of painful intumescence of the belly (with or without fever), with irregularity of surface caused by associated areas of dulness and resonance from fluid, gas, and tumor formations of rapid growth, with emaciation, pain, and the development of cachexia, will usually suffice to distinguish peritoneal carcinoma. Ascites may, however, be so intense as to prevent the recognition of other physical conditions, in which case paracentesis may be resorted to. This should be done with due caution, as it is sometimes

followed by unhappy results, especially in cases of colloid cancer (Faucon : *Jour. des sci. méd. de Lille*, iii., 177). The operation is contra-indicated where the physical conditions allow a tolerably certain diagnosis to be made, and should never be done unless the patient be confined to the bed and vigilantly cared for for several days afterward. If, after paracentesis, a solid tumor be detected, the presumption in favor of its malignant nature is strong. The character of the ascitic fluid is of the utmost importance. It may be like ordinary ascitic fluid, but it is very often sanguinolent, a condition almost characteristic of malignant disease. The detection of epithelial cells, such as occur in carcinomatous growths, in the sediment of this fluid, may be considered as conclusive of its cancerous origin.

Pathological Anatomy.—In necropsies, after the more acute primary cancers of the peritoneum, the nodules may be found scattered over every part of the membrane. They may be no larger than millet-seed, and of a whitish or grayish color, and without inflammatory areola. Miliary tuberculosis may be closely simulated. Usually, the nodules vary within much wider limits, often attaining the size of hen's eggs or oranges. They remain sharply circumscribed, or merge into masses of greater or less extent, sometimes forming great plates of infiltration. In the mesentery, Chuquet asserts that the nodules commonly are situated near the points of intestinal attachment. Nodules of the size of a grain of wheat, or of a pea or bean, are very apt to have central depressions, differing thus from tubercle. In the process of growth they tend to assume a spherical form, and may even become pedunculated, showing a resemblance to clusters of white currants (Bristowe) ; or the pedicles may become reduced to mere threads, and indeed, as in a case reported by Matthews Duncan (*Med. T. and G.*, 1872, ii., 432), they may be severed and the nodules float free in the abdomi-

nal cavity. Sometimes the new-growth at first looks as though drops of melted white wax had fallen upon the membrane and there hardened, an appearance also met with in cancer of the intestinal mucous membrane. When diffused infiltration of the membrane occurs it may, in proportion to the rapidity of its development, have the characters of medullary or of scirrhous cancer. The colloid change may affect either variety.

In medullary cancer, soft, brain-like masses may line the parietal peritoneum forming infiltrations of great thickness ; or, involving the peritoneal coat of viscera, may deeply imbed them, sometimes without involving their structure. The greater omentum may thus become greatly thickened. Such masses may form, with inflammatory products, conglomerations of bowels, peritoneum, and viscera. This is especially the case in the pelvic cavity. The new-growths will be of light or dark gray or reddish color, with often brownish centres from extravasation. Scattered throughout the masses little cystic accumulations of clear gummy fluid may often be discovered. A granular or mammillated aspect will be presented, while in structure such friability may be presented that the infiltrations readily break down under the finger. Masses may attain the appearance and size of the adult human brain.

In more chronic primary carcinoma, the new-growth may be more localized and the tumors be much fewer in number, though sometimes reaching great size and weighing several pounds. The softer varieties are usually very vascular. In the scirrhous forms, the peritoneum may be thickened by a dense infiltration, giving it a leathery appearance ; and the great omentum, reduced to a contracted and thickened band, will stretch across the abdominal cavity. Colloid cancer, which will be frequently met, will be recognized by its semi-fluid, gelatinous appearance.

It is apt to form great masses, and to be widely diffused. In all varieties the peritoneum will often be opaque and thickened almost throughout. Primary peritoneal cancer may also be metastatic, attacking neighboring parts or viscera; or, it may spread by continuity, growing into adjacent organs from the surface, or, extending through the diaphragm, involve the pleuræ. Sometimes organs are completely destroyed by the infiltrations. This is especially the case with the ovaries.

Secondary cancer of the peritoneum will usually be found most densely distributed near the primary centre, whence it has extended by continuity. In such cases, the colloid form is very frequently observed. The anatomical conditions will only differ from those of the primary forms in the superadded pathological changes. The intestines will show various degrees of alteration. They will be more or less constricted, the narrowing reaching its highest grades in the cases where the mucous membrane was primarily affected. Swelling and œdema of the mucous membrane are often found. In all cases evidences of peritonitis will rarely be absent; and masses will sometimes exist where central softening has occurred. Perforation of the bowels, with escape of their contents into cavities thus formed, is not unknown; and limited areas of fatty degeneration and calcification occasionally are detected. Evidences of hemorrhages, of greater or less extent, are not unfrequent.

Treatment.—As the affection runs a necessarily fatal course, treatment must be directed toward the alleviation of suffering and the assistance of the powers of assimilation. Other indications for treatment must be met as they arrive. No treatment addressed to the carcinoma itself will avail.

A CASE OF ACUTE POLIOMYELITIS IN THE ADULT.

By JOHN VAN DUYN, M.D.,

SYRACUSE, N. Y.

History : F. D., a clothier's clerk, twenty-three years old, of average height and good muscular development. Had worked on a farm during summers until 1880, which year he spent at school. Early in 1881 he entered a clothing-store as clerk, but in the following November he had malarial fever, and in February. 1882, had a moderately severe attack of typhoid fever. From the time of his recovery, in early spring, until the following October, he worked on a farm, and then resumed his position as clerk. Had never had venereal disease, and had never been intemperate in the use of alcohol.

Aug. 24, 1883, he walked nine miles, arriving at his destination at two o'clock the next morning, went to bed at three o'clock, and slept six hours. At noon, he engaged with others in "putting" a stone, which weighed nearly forty pounds, and in jumping. The stone was "put" from the shoulder by the right arm forward, and thrown by both arms over the head backward. This contest was most violent and lasted two hours. Then he ate a hearty dinner. At 4.30 P.M. he walked over three miles, then rode in a stage two miles, and in the cars ten miles, after which he walked with friends in the city, and finally went to bed at eleven o'clock. The next day he felt some soreness, which, in a day or two, entirely passed away. Until the end of the two weeks following, his life was as it had been before. By his exertion he did not become overheated, was not chilly, nor did he take cold. On September 7th, when he woke in the morning, he felt severe pain between the shoulders, equal in intensity on both sides of the spinal column, which was greatly increased by turning the head to either side. He went to work, but during the day he felt chilly and his face was very red. In the afternoon the right hand began to lose its grasp, so that he could hardly hold the pencil in making sale-tickets. The power to use this hand grew gradually less, until, three days later, it disappeared entirely. That evening

he rode ten miles by rail. He could not sleep because of headache, chills, and nausea. The soreness became universal. The second day, he got up, could raise the right hand to his face, but could not button his clothes with it. He walked to see the village doctor, but found the strength of his legs failing to the extent that, in the afternoon, when he rode home, three miles distant, he could with difficulty get into, and out of the wagon. Went to bed at night and " took a sweat." The third day, felt sick and sore, but could get up and even went out of the house. When he tried to put on his hat with his left hand, the right being powerless, he found it impossible, and with difficulty only could he lift this hand to the latch of the door. After he had gone to bed at night he found he could not raise either elbow from the bed. From this time on he was confined to the bed. He suffered from general soreness. To breathe gave him pain, and he could not lie on either side, because of the pain which the pressure on the chest gave him. The whole body, excepting the head and neck, was so sensitive that suffering was caused by the gentlest touch. During the following three or four days paralysis of motion became general in the extremities, but not affecting the head, neck, thorax, and the left forearm and hand. Could not raise his heels from the bed, but while on his side, could partially flex the thighs on the abdomen. Constipation became severe, but the bladder was unaffected. During this time the temperature was twice observed and recorded. On the fourth day it rose to 102°, a few days later to 101°. After the tenth day improvement began to be manifest, and continued until the end of the second week, when he could get into a chair, but could not stand, nor could he raise his feet from the floor. The soreness had receded to the shoulders. At the end of the third week, could walk with assistance, but could not lift the feet higher than enough to prevent dragging. Constipation continued and did not disappear until two months later. The right arm was powerless. The left arm was recovering strength rapidly. This arm had not been affected below the elbow. At the end of the fourth week he could walk alone, the right leg having regained considerable strength, but the left leg could as yet be moved only with difficulty. At this time he began to feed himself again, by using the left hand after the elbow had been rested on the table. Throughout there had been no abnormal sensations, no numbness. During these four weeks he lost sixty pounds in weight.

Examination, Jan. 12, 1884: Complete loss of voluntary motion in, and great atrophy of all the muscles supplied by the right brachial plexus, excepting those supplied by the fifth and sixth cervical roots. The right hand, with extreme atrophy in all parts, was *en griffe*. The muscles of this extremity, including those of the shoulder, were unaffected by faradism, but all, with the exception of those in the hand, reacted to strong galvanism. On the left side the supra-spinatus and infra-spinatus were greatly atrophied, the pectoral muscles less so, while all contracted under faradism. The elbow could with greatest difficulty be raised to the level of the shoulder. Below the shoulder the left arm was normal. Power to raise either knee was diminished. The left anterior tibial was not under control of the will and was atrophied, but reacted to strong faradism. Because of the loss of this muscle the foot falls in extension when raised.

To the present time, May 16th, treatment by electricity has been almost daily. All the muscles of the right upper extremity contract under galvanism, with the formula CCC. > ACC., while the brachialis anticus, biceps, sup. longus, and pectorales major and minor contract under faradism. The pectoral muscles, biceps, and anterior brachial show decided contractions by the will. The nutrition of these muscles under the influence of the will so far exceeds that of the others that their growth causes them to stand out in marked contrast with the surrounding atrophy. The will has control of all the affected muscles of the left shoulder and of the left anterior tibial.

This typical case of acute spinal paralysis is recorded because of the clear history of the progress and retrogression of the paralytic state, and the manifest relationship between the disease and the violent muscular exertion which preceded it. Should the gymnastic violence be conceded as the cause, than which no other is apparent, then interest must attach itself to the length of time which intervened between the cause and the outbreak of the disease, and to the fact that while both extremities, upper and lower, were affected during the fever, the muscles which remained paralyzed and atrophied were those most violently exercised, and the severity of the results and their permanency are in direct ratio with the use of the muscles.

AN UNIQUE CASE OF POLIOMYELITIS ANTE-RIOR ACUTA OF THE ADULT.

By AMBROSE L. RANNEY, M.D.,

PROFESSOR OF APPLIED ANATOMY IN THE NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL.

I DESIRE to call attention to a case which has lately come under my personal notice, and which seems to present some very striking peculiarities. I refer to a marked attack of poliomyelitis of the acute (?) form in the adult, which was followed by a paralysis of the leg and arm of opposite sides. Although in the literature of the subject different forms of paralysis—such as monoplegia, para-plegia, hemiplegia, and paralysis of all four limbs—have been recorded, I am unaware of a case where there has been the peculiar combination of symptoms which I now record. In Seguin's brochure upon this disease, published in 1874, he cites from Duchenne four cases, three of which had all of the limbs affected, while one developed paraplegia. Those selected also from Charcot and Gombault, as well as the personal cases cited by that author, do not contain a single instance of a similar type. In my search through the vari-ous text-books and the journals published since that date, I have failed, as yet, to detect a parallel instance. If I am correct in my belief and in my diagnosis, the case presented is unique.

The history of the case is published as it was noted at the time of my clinical examination. I hoped to be able

to publish a more detailed statement in regard to the exact measurements of homologous parts, the electro-muscular reactions, etc., but I was disappointed by the patient failing to keep an engagement made with me for that object. I was unable also to obtain a photograph of his limbs for the same reason.

The history obtained from the patient is given in full.

A young man presented himself at one of my clinics in Burlington, Vt. (April 27, 1884) with the following statement of symptoms :

Age twenty years. Unmarried. Occupation—that of a laborer. In the summer of 1882, patient was employed in a saw-mill, and was obliged to run a treadle with his left foot and to push boards against a circular saw with his right hand. Shortly previous to the time of the development of his nervous trouble, he was severely stung by a swarm of bees upon the exposed portions of his body. He noticed no particular results from the accident, however, and the wounds healed kindly. After a day's fishing, the patient slept upon the wet grass and was attacked immediately with a marked febrile disturbance, which was followed by a paralysis of sudden development.[1] The paralysis was confined exclusively to the *left foot and leg*, and the *right upper limb* (the ones which he constantly employed in his daily vocation). The leg-paralysis disappeared with great rapidity, and in a few weeks he was able to use the right and left lower extremities with equal power. The right arm, however, never regained its power, and began to give evidence of rapid wasting of the muscles of the shoulder and hand. He has never noticed a wasting of the muscles of the lower extremity.

On examination, the grasping power of the right arm was almost abolished ; the muscles of the thumb were atrophied to such an extent as to allow the fingers of my hand to perceive each other with distinctness when they grasped the hand between the metacarpal bones of the thumb and the index-finger. The "bird-claw" deformity of the hand was partially developed, but the interossei showed a less-marked wasting than existed

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[1] The patient stated at first that the paralysis came on "inside of a week "; but on being questioned sharply, he stated that "he was not sure but that it occurred in two days." He was positive, however, that it developed not more than seven days after sleeping on the wet ground.

in the thenar eminence. The deltoid was almost completely destroyed, and the muscles of the scapula were also affected to a marked degree. The circumference of the limb was less than that of its fellow. A very strong faradic current produced slight contractions of some of the muscles of the hand and forearm, but the entire limb seemed to respond very feebly to the current, and no electro-reaction occurred in the muscles of the thumb. No constant-current battery was at hand; so that the "reaction of degeneration" was not positively demonstrated, although it would undoubtedly have been found in many of the muscles.

The lower limbs exhibited no atrophic changes or loss of muscular power. The sensibility to tactile sensations and the impressions of pain and temperature were normal in all of the limbs. A careful examination was made of these points. The patient had been subjected to massage and the faradic current at intervals for months, but without apparent benefit. The bladder and rectum had never given any evidences of impairment.

Certain peculiarities in this case struck me, as follows:

1st. The continued use of the right hand and left leg seemed to act, to some extent, as an etiological factor in the case. The cord was apparently attacked in those segments that had been subjected to excessive and continuous use, and the lateral half of the cord had been involved in each instance. The left arm and right leg, which were not employed in his occupation, were not attacked.

2d. The leg-paralysis recovered quickly and perfectly; but the arm and hand never regained their power. He had been severely stung upon the arm but not upon the leg, although this may not have been more than a coincidence.

3d. The cells of the anterior horns in the cervical segment degenerated rapidly, as evidenced by the rapid atrophy of the shoulder and hand, while those of the lumbar segment experienced no permanent impairment and regained their function in a few weeks.

I can see no elements of doubt as regards the diagnosis of this case. The exposure, the febrile symptoms, the

paralysis of sudden advent, the subsequent atrophy of muscles, and the monoplegic type of the palsy, coupled with the fact that the limbs involved were on opposite sides of the body, can be explained to my mind in no other way. The quickly-developed loss of farado-muscular reaction also adds a crowning feature to the list of symptoms. The case seems to be a particularly unique one of this comparatively rare form of disease.

ANALYSIS OF SEVENTY-FIVE CONSECUTIVE CASES OF POSTERIOR SPINAL SCLEROSIS, WITH SPECIAL REFERENCE TO A SYPHILITIC ORIGIN.

By E. C. SEGUIN, M.D.

IN the last three years a considerable number of observers, European and American, have recorded the statistics of cases of posterior spinal sclerosis, with especial reference to its relations to syphilis. And every addition to these statistics, even if limited in numbers, is help toward the elucidation of the question of the etiology of tabes. Through extensive coöperative work of this kind, we may reap scientific and even practical results of some value. This consideration has led me to go through my case-books and contribute my mite to the subject.

The cases of tabes which have come under my observation since 1866 are naturally divisible into two classes : *i. e.*, those seen in private practice, and those observed at my clinic for diseases of the nervous system at the College of Physicians and Surgeons. The last named cases were examined and published by my friend, Dr. Birdsall, last year,[1] and I do not care now to reproduce that tabular statement. Suffice it to say, that Dr. Fuller, one of my clinical assistants, went to the trouble of going over the clinic case-books again, and reached the same numerical results as Dr. Birdsall.

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[1] " Proceedings of the American Neurological Association," meeting of 1883, *Journal of Nervous and Mental Diseases*, July, 1883.

I now propose to present the results of an analysis of the cases of tabes which have been seen by me in private practice.[1]

The total number of cases was 75, including a number in the first stage, and a few which, while exhibiting many of the symptoms of tabes, were not typical.

I am surprised to find that in a large proportion no mention was made of syphilis.

No mention made of syphilis, 21 cases	.	. . .	28 %
Syphilis mentioned . . 54 "	.	. . .	72 %

It is therefore better to exhibit the further proportionate results in a double aspect.

I. With reference to the total number of cases of tabes recorded :

Syphilis not mentioned in . .	21 cases	. . .	28 %
No chancre or syphilitic symptoms in	15 "	. . .	20 %
History of chancre or syphilis in .	39 "	. . .	52 %
	75 "	. . .	100 %

Thus in more than one half of the total number of cases a distinct history of syphilis or of chancre was obtained.

II. In the more correct relation to the number of cases of tabes in which a positive statement was recorded on the point in question :

No syphilis or chancre in .	15 cases	. . .	27.78 %
History of chancre or syphilis in	39 "	. . .	72.22 %
	54 "	. . .	100.00 %

This very large percentage is somewhat in accord with the results of Erb, Fournier, Voigt, Rumpf, and others.

For those who still believe in the distinct duality of the syphilitic poison (*i. e.*, in the existence of non-infecting chancres), the following additional summary may not be without interest :

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[1] These statistical results were presented by Dr. Birdsall, on my behalf, to the Am. Neurological Association at its recent meeting in June.

Cases in which chancre alone occurred . . .	23	.	42.59 %
Cases in which chancre and secondary syphilis occurred,	16	.	29.63 %
Cases in which there was no history of syphilis . .	15	.	27.18 %
	54		100.00 %

At first sight this exhibit might seem to militate strongly against the syphilitic origin of tabes; but upon further consideration, when one reflects upon the very large proportion of cases of common (*i. e.*, non-systematic) cerebral and spinal lesions, in which we only obtain a history of chancre, followed by years of good health, then by the nervous lesion, it becomes necessary to drop this objection. But even admitting that there are harmless " soft " chancres, we also know that in a large proportion of cases of " hard " chancres, skilful treatment may indefinitely postpone so-called secondary symptoms.

EDITORIAL DEPARTMENT.

REMOVAL OF THE UTERINE APPENDAGES.

A LETTER

By Lawson Tait.

I have written so much on this subject, that I am almost ashamed of putting pen to paper about it again ; but I am so constantly subjected to misrepresentation, that it is difficult to resist the inclination to reply. The article [1] by Dr. William M. Thallon obliges me to ask for some space, for whilst he gracefully credits me with far more than I deserve, he also to some extent misunderstands what I have written, or he has taken my views second-hand.

In the first place, I object altogether to the title of his paper : "The Battey–Tait Operation." The method of applying names of persons to particular proceedings is a constant source of error, and it clearly is so in this instance. I have no objection to be bracketed with my distinguished friend Dr. Battey, but as the principles of our proceedings differ entirely, such a union as is proposed by Dr. Thallon is wholly inconsistent. Dr. Battey proposed the removal of the ovaries for the purpose of bringing on artificially the menopause, for the purpose of influencing certain indefinite reflex symptoms. This proposal I have followed five times, and with such bad results that I have said over and over again in published papers that I should not continue the practice. Dr. Thallon is not justified, therefore, in saying that I have done hundreds of such operations, that Spencer Wells has done only one or two, and Keith one or two. Dr. Thallon is mixing up

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[1] Vide editorial in April number of Archives.

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things that are wholly distinct, and I have protested against this mixture very many times.

The principle of the operation I advocate is to save life and relieve suffering by the removal of diseased organs, or for such conditions of physical disease as appear, on theoretical grounds, sustained by actual experience, to justify the proceeding. I rarely operate save in the presence of physical signs ; and in the exceptional instances of operations performed for subjective symptoms only, I carefully guard myself by elaborate consultations.

Let me first speak briefly of Dr. Thallon's conclusions, and then I may say a few words on some passages in the text of his paper.

His first conclusion is that "the operation (Battey–Tait) is not justifiable for purely nervous symptoms, independently of clearly-marked evidences of organic ovarian disease." I wholly agree with this, only I say this is a criticism of Battey's operation, and not Tait's.

Dr. Thallon's second conclusion is that "it is not justifiable in cases of uterine disease or hydro-salpinx."

In answer to this I say that my proposal to remove the appendages for uterine myxoma, made almost simultaneously by Hegar and myself, and therefore, on Dr. Thallon's plan, entitled to the name of the Hegar–Tait operation, has been in my hands a brilliant success. Mr. Knowsley Thornton has found it so successful that he says it should always be a preliminary to hysterectomy. I agree with him so far, that I believe if it were so, there would be a very small number of cases left for hysterectomy. The success of this proceeding has been so great, and has received such abundant confirmation, that I cannot imagine how Dr. Thallon gets his conclusion.

As to hydro-salpinx, I have written so much on this point that I can only feel that Dr. Thallon has omitted to consult my writings. As it is wholly impossible to diagnose with accuracy the existence of hydro-salpinx without abdominal section, as it is wholly impossible to be sure of its position, tapping is altogether out of the

question. The recommendation of tapping as an alternative for removal of the diseased tube, can come only from one who has no practical acquaintance with the disease.

On this point let me just interpolate a complaint against one sentence of Dr. Thallon's article, in which he says : " Mr. Lawson Tait in especial has been singularly rash in minimizing the risks, and he has probably done a great deal of harm in encouraging men to undertake a so-called 'easy operation,' which too often has ended fatally for the patient."

I protest against this as most unfair. I have never said it was an easy operation. I have always said it is one of the most difficult things in surgery. I have never encouraged any one to do these cases unless he was prepared to do as I have done—give up every thing else to follow them. I have always said, and I say again, that a man whose prospect is to do only five or six cases of this kind in a year has no right to attempt them, and that if he does and they are fatal to the patients, he has done a very wrong thing. I have never minimized the danger, I have constantly emphasized it. I have never said that my own mortality, about one per cent., could be reached by any body save by doing as I do, devoting my life to the work, and operating five, six, or eight times a week.

Dr. Thallon's third conclusion, that the operation of removal of the uterine appendages for the relief of uterine hemorrhage, or the arrest of uterine tumors, I have already answered.

Dr. Thallon's fourth conclusion I accept with more than pleasure, as it is conveyed in words extremely gratifying to me. I have had a hard fight during eight years to establish my position, and now, thanks to Dr. Kingston Fowler, of the Middlesex Hospital, it has been completely established. That my work is accepted as " one of the most glorious achievements of the surgery of our age " is reward enough for all my trouble.

Dr. Thallon raises the much-discussed question as to the influence of removal of the ovaries and tubes in menstruation. Let me say here again what I have recently said completely, and several times incompletely. Removal of the ovaries alone has little or no

influence in arresting menstruation. Removal of the tubes alone arrests menstruation in five out of six cases. Removal of both tubes and ovaries has the same result as removal of the tubes. There are some cases in which even removal of the fundus uteri together with both tubes and ovaries exerts no influence whatever on the periodic regularity of the menstrual flow. In the course of a few days a paper will appear in the *Medical Times and Gazette* comprising the doctrine of Ritchie and Reeves Jackson, that menstruation and ovulation are wholly independent functions. Dr. Thallon seems never to have come across even a suggestion of this before, and, therefore, much of his criticism of my own views I cannot answer here for want of time and space. But if gynæcologists for the future will approach this question with the glimmering of an idea that it is just possible the two functions may not be dependent one on the other, much trouble, confusion, and repetition will be saved.

As to the influences of the removal of the uterine appendages for masturbation or nymphomania, I am quite satisfied that the prospect of good being done is very small. I have, therefore, persistently refused to operate in such cases, as I have not found that removal of the appendages has deprived women of their sexual appetite. Only a few weeks ago, at the Harveian Society, Mr. Bryant of Guy's and myself were able to quote cases where supravaginal hysterectony did not in the least interfere with the sexual appetite. Even if removal of the uterine appendages did destroy it, I for one would not hesitate to operate for the cure of disease ; and I would look upon any man as an inhuman brute who would refuse relief to his suffering wife because his lusts would have some smaller gratification. The only men who would take such a view of their position would be those who had brought the troubles of hydro-salpinx and pyo-salpinx on their wives as the result of gonorrhœa. To me it becomes more and more amazing that this disgusting argument should be discussed. It is our duty to save life and prevent suffering, not to pander to the degraded desire of the debauché.

Dr. Thallon points out what is perfectly true, that, whereas, I

do a hundred such operations, Sir Spencer Wells does one or two, and he further says that we must see about the same class of cases. I admit this, but I plead that I am a generation younger than Sir Spencer Wells, and I admit that when my time comes I shall probably have the same difficulty in taking up a new theory that Sir Spencer has shown in the present case. Some months ago Dr. Horrocks asked me at the Obstetrical Society how it was I saw so many cases of pyosalpinx and that they saw none at Guy's Hospital. My reply was that there must be large numbers of them at Guy's Hospital but that they were not discovered. Dr. Thallon says that I take particular delight in saying that in many of my cases operation had been previously refused in London, and if Dr. Thallon knew how much I have been misrepresented and maligned by some of my London brethren he would not be surprised. But my delight has been greatly intensified by a paper read last week by Dr. Kingston Fowler, which proves up to the hilt every thing I have said on the subject, and completely covers the ground raised by Dr. Horrocks, and justifies my answer to it. In the discussion on Dr. Fowler's paper, Dr. W. S. Playfair said that a middle course between the practice at Birmingham and that of those who denounced the operation was the safe one. He illustrated this safe course by his own proceedings, which resulted in the awful mortality of twenty-five per cent. All I can say is that I hope I may never fall into this safe course of Dr. Playfair, for if I do I shall speedily give up practice. No man is justified in operating in such a way. What I constantly plead is that these operations can never be justified save by a very low mortality. If my mortality went up to twelve per cent. I should stop.

I entirely endorse what Dr. Thallon says about the cases where the operation is done for " pain, epilepsy, or insanity." It is too much of the nature of a leap in the dark to have my support. I do not condemn it, however, for there have been some brilliant successes, and there ought to be no mortality at all when there is merely a removal of normal appendages. Speaking of a case related by Dr. Fordyce Barker, Dr. Thallon says he thinks I would not have hesitated to operate in it. He is entirely wrong, for as he gives

the case, I should certainly have refused, and have done so in several very like it.

Upon two points let me say that I entirely agree with Dr. Thallon. He says : " Where, however, one ovary lies so low down as to be the first thing encountered by the finger after entering the vagina, especially if it is bound down by adhesions, or by a heavy and retroverted uterus, the chances of any thing short of the radical operation effecting a cure are very slight." This is absolutely true, and some of my most brilliant successes have been in precisely such cases.

Again, Dr. Thallon says : " I believe it is, broadly speaking, true that the more extensively the ovaries are matted up in the products of an old peritonitis, the greater will be the necessity for the operation." This is quite correct, but I cannot at all agree with Dr. Thallon when he further states that this "suggests the unpleasant reflection that the greater danger is there of it being fatal."

In conclusion I have only to say that I have examined with great care the contents of many Fallopian cysts and have never seen, though I have specially looked for, columnar ciliated epithelium. The suggestion of Dr. Frank Ferguson has therefore been anticipated and exhausted.

BIRMINGHAM, *May* 6, 1884.

DR. THALLON'S REPLY TO MR. TAIT.

The answer of Mr. Lawson Tait to some points in my article is chiefly interesting in what it admits. I am extremely glad to find that two of my four conclusions are so heartily endorsed by him. I think it will certainly surprise some of the enthusiastic gynæcologists who have been doing "Tait's operation" for all sorts of purely nervous symptoms ("pain, epilepsy, and insanity") to learn that Mr. Tait himself "wholly agrees" with me that the operation is not justifiable for this class of cases,—and that "it is too much of the nature of a leap in the dark to have my (*i. e.* Lawson Tait's) support."

That declaration is decidedly more explicit than any limitation

to the operation which I have hitherto been able to find in Mr.
Tait's writings in spite of pretty careful search.   And I may as
well say just here—that my knowledge of Mr. Tait's published
writings is in no case second-hand, as he seems to imagine.   I
think far too highly of their distinguished author, and appreciate
their positive and vigorous style too much, to allow any of them
to pass me by unread.

Mr. Tait objects to my title of the Battey-Tait operation, be-
cause he and Dr. Battey do their respective operations for differ-
ent reasons.   That is quite true, but then the results of an operation
are what it is judged by.   It is doubtless very self-comforting for
Mr. Tait to suggest that all the errors arising from removal of the
ovaries are due to the ideas of his "distinguished friend Dr.
Battey," while all the gains are due to his own practice of also
removing the tubes.   But that is not very convincing, and if we
accept Mr. Tait's personal experience that he has done Battey's
operation "five times and with such bad results" that he will
"not continue the practice," I imagine it will be with the logical
consequence of making the profession somewhat sceptical of the
good results of "Tait's operation."   In the meantime I must beg
to retain the title I have adopted, if for no other cause than to
emphasize the fact that there is so much diversity of reasoning
underlying this operation.

The main points on which Mr. Tait and I are at issue concern
the value of the procedure in cases of uterine disease, hemorrhage,
and myomata.   And this incidentally raises the question of the
influence of the removal of the ovaries and tubes on menstruation.

Mr. Tait speaks with no uncertain sound on these points.
While Dr. Battey proposed his operation of removal of the ovaries
for the very purpose of bringing about the cessation of menstrua-
tion, Mr. Tait boldly declares that Battey's operation has little or
no influence in this direction.   On the other hand, he alleges that
the Tubes are *fons et origo mali*, and that their removal alone
five times out of six will stop the flow ?   How does he know that ?
In how many cases has he removed the tubes alone ?   On page
66 of his book on "Diseases of the Ovaries" (fourth edition, Wm.

Wood & Co., 1883) he says : " I always remove the ovaries along with the tubes, as without the ducts the glands are of course useless." Again, on page 327, in discussing this class of cases, he says : " In my own practice the conclusion is indicated that removal of the Fallopian tubes is more important than removal of the ovaries, and in by far the larger number of my cases that alone might have sufficed—indeed, in many it has done so." With the physiology underlying this practice I entirely dissent, and submit that it is radically unsound. Mr. Tait's main addition to our knowledge seems to me to consist in showing the only method of relieving a large class of sufferers from otherwise incurable salpingitis, but the incurable conditions in these cases are in nowise due to the functional importance of the tubes, but to their anatomical situation and conformation. In support of the very important functional rôle he ascribes to the tubes he has adduced no evidence. In his belief he apparently stands alone, for even though menstruation and ovulation were proven to be entirely distinct and independent functions—which is very far from being the case,—he would still have to bring forward any evidence that the tubes are the main factors in causing menstruation. The energy of Mr. Tait's statements on this whole question cannot obscure the fact that the whole burden of proof lies with him. He seems to me in this portion of his reply to be pleading like an advocate at the bar in defence of Tait's operation. That is a false mental attitude. I think on such an issue partisanship is not likely to carry much weight in overthrowing long-established scientific beliefs, and the impartial seeker for truth is tempted to exclaim, as a famous Englishman did after listening to a famous and dogmatic colleague : " I wish I was as cock-sure of any thing as ' he ' is of every thing." The reasons I brought forward for holding the beneficial effects of the Battey-Tait operation as " not proven " for the cure of uterine myomata and hemorrhage, Mr. Tait makes no attempt to answer, and I need not therefore repeat them.

In discussing the small influence of the operation on the sexual appetite, I am glad to find that Mr. Tait and I so closely agree.

With regard to one point, Mr. Tait complains that I have done him an injustice in saying that he minimizes the risks of the operation.   Now I was careful to point out that the wonderful results obtained by Mr. Tait went far to justify him personally in operating, but in his influence as a teacher I think he largely justifies my accusation.   To go no further than his very reply in reference to my statement that "the more extensively the ovaries are matted up in the products of an old peritonitis, the greater will be the necessity for an operation," Mr. Tait says : "This is quite correct, but I cannot at all agree with Dr. Thallon when he further states that this suggests the unpleasant reflection that the greater danger is there of it being fatal."   Now I would like to ask any fair-minded reader if it is unfair or unjust to say that Mr. Tait minimizes the danger of the operation when he says he cannot at all agree that extensive adhesions add to its danger ?

With reference to the diagnosis of the contents of Fallopian cysts from the presence of columnar ciliated epithelium in their contents, the suggestion was based by Dr. Ferguson on the examination of a number of cases.   The evidence will in due time be published, and in the meantime I can only say if the suggestion was "anticipated" by Mr. Tait, it certainly was not "exhausted" by him !

In conclusion I am glad to find Mr. Tait so entirely agrees with me in my statements regarding the large class of cases in which the operation is positively justifiable.   In helping us to recognize this class of cases, especially those where incurable and painful disease of the tubes exists, Mr. Tait has done great and good service.   But while willingly paying my tribute of admiration to the brilliancy of his practical results, I beg to enter my most earnest protest against what I esteem the false physiology, in spite of which those successes have been attained.

<div align="right">WILLIAM M. THALLON, M.D.</div>

Brooklyn, *June* 22, 1884.

NEW BOOKS AND INSTRUMENTS.

Studies in Pathological Anatomy. By Francis Dela-
field, M.D., Professor of Pathology and Practical Medicine, Col-
lege of Physicians and Surgeons, New York. Vol. II., Part 1.—
"Broncho-Pneumonia." Plates i. to xii. New York : Wm. Wood
& Co., November, 1883.

The first volume of Dr. Delafield's excellent "Studies" has
been completed in 1880, and comprised the subjects of peritonitis,
pleurisy, pneumonia, empyema, hydrothorax, bronchitis, tubercu-
losis, and phthisis ; illustrated with ninety-three plates. The
work has received its due share of praise at home and abroad as
one of the best productions of American pathology.

The fasciculus before us is a continuation of the above
"Studies" and forms the first part of the second volume. The
text consists of fifteen royal octavo pages, in large type, giving a
concise description of the lesions comprised under the term
broncho-pneumonia, and is illustrated by seven full-page photographs
and five double-page lithographic plates ; all being reproductions
of original photographs, and drawings from the author's skilled
hand.

These illustrations are quite beautiful and well selected ; they
give the work an exceptional value, and form its essential feature.
Strictly speaking the work is an atlas of high artistic and scientific
value, for advanced students and specialists, rather than a treatise
of pathological anatomy. Some of the drawings are executed
under enormous amplification (x 1,500, etc.) which, although
quite instructive in giving the extreme histological details, are
hardly accessible to the ordinary medical mortal, and less useful
than the inviting pictures representing a moderate amplification,
such as any student can see and compare with the specimen under
the microscope. Fortunately, however the majority of Dr. Dela-

field's illustrations are of the latter class, and in proportion there are more of them in the fasciculus before us than in the first volume. An admirable feature are the author's photographs of the gross appearances or of pictures only slightly amplified. These are surely true to nature, are useful in conveying to the reader the exact and correct idea of the lesion under consideration.

The twelve illustrations referred to and the accompanying text give us, as stated, a very good and clear chapter of the author's views " on some of the forms of non-tubercular broncho-pneumonia."

Dr. Delafield appears to be an adherer to Virchow's view on the dual origin of phthisis ; he strictly distinguishes a non-tubercular from a tubercular form of broncho-pneumonia or phthisis. Admitting the difficulty in separating broncho-pneumonia from phthisis, he expresses his position and view on this question as follows :

" In both we find the same combination of peri-bronchitis and diffuse pneumonia ; the peri-bronchitic pneumonia characterized by the implication of the walls of the vesicles and the presence of permanent tissue in their cavities.

" In both the cellular infiltration of the walls of the bronchi may lead to their dilatation and to the formation of cavities.

" In both there are inflammatory changes involving the connective-tissue framework of the lung ; and when these changes have once commenced, there is the same tendency to a persistence and extension of the inflammatory process.

" In both we may have much the same clinical histories.

" But in broncho-pneumonia there are no tubercle tissue, no tubercle bacilli, no obliteration of blood-vessels, no areas of co-agulation necrosis, and comparatively little cheesy degeneration of inflammatory products."

From croupous pneumonia the author distinguishes the lesion under consideration, thus :

In broncho-pneumonia " there is not merely an accumulation of inflammatory products in the cavities of the bronchi and air-vesicles, as in other forms of pneumonia, but also inflammatory changes in the walls of the bronchi and vesicles, so that the tissue of the lung is much more seriously changed, and changed in a way much more likely to remain permanent."

The author believes that in every pneumonia there is some bronchitis present : if this bronchitis is more prominent than the changes in the pulmonary tissue, or if the latter is affected only in

limited areas around the bronchials, the lesion is then to be designated a *broncho-pneumonia*. The characteristic gross appearances of sections of such lungs are well shown in the author's photographs. Grayish peri-bronchitic nodules of various sizes and figures, often densely packed, are seen scattered throughout the parenchyma of the lungs, which otherwise may be merely congested or may be variously affected. Dr. Delafield states that the extension of the inflammation, from the affected bronchioles, is not to the air-vesicles which empty into that bronchus, but into those which are in contact with it. It is "as if a red-hot needle were thrust through the lung, making a tract of charred tissue around it. So each of these inflamed bronchi along its whole length is surrounded by a zone of inflamed air-vesicles."

The author distinguishes an acute form of broncho-pneumonia from a chronic or "persistent" form of this lesion. He describes and illustrates each form by well-studied typical cases observed among adults as well as children, but preëminently in the latter. Each case is accompanied by an autopsy record, microscopical studies, and instructive drawings or photographs of the lung lesions.

The acute form of broncho-pneumonia is identified with "capillary bronchitis" of the adult and the pneumonia of children which follows whooping-cough, measles, scarlatina, diphtheria, etc., but may also occur as an idiopathic affection.

Death may ensue within a few hours from the onset of the attack, or may last days or weeks. But recovery appears to occur quite commonly and perfectly in this affection.

Less frequently, the author says, a chronic inflammation of the interstitial tissue of the lung is developed and the child goes on to have a *persistent broncho-pneumonia*.

The attacks may repeat themselves year after year while the child grows up to adult life. Lungs gradually become consolidated, pleuræ thickened, never returning to normal condition, and "*the patient develops acute general miliary tuberculosis*."

In all cases of persistent broncho-pneumonia the general conditions are given by the author as follows .

"(1) A chronic bronchitis with or without dilatation of the bronchi ; (2) the formation of new connective tissue in the walls of the bronchi and the air-vesicles, along the course of the bloodvessels, in the interlobular septa, and pulmonary pleuræ ; (3) obliteration of air-vesicles, and the production of epithelium and pus within them. The exact condition in each case depends upon the extent of lung involved."

The author lays further stress upon the emphysematous conditions and collapse of groups of air-vesicles or parts of lungs and upon occasional tuberculous inflammation of the bronchial glands as concurrent affections.

As a whole, the author's descriptions are clear, precise, and to the point. None but favorable comments can be justly made.

It is easy to recognize *acute* broncho-pneumonia as an independent affection. This affection in its typical form is, however, seldom seen upon the autopsy table, as the patients in a great majority of cases either get well or the disease has run a chronic course.

A closely analogous lesion, the induced or inhalation broncho-pneumonia, has of late repeatedly been studied in dogs and other animals and has thrown a good deal of light upon the lesion under consideration. If animals are forced to inhale irritative particles (sputum, pus, or powders of any kind) suspended in the air by means of a spray apparatus, or if the material is introduced through an opening in the trachea in the neck, an exquisite acute broncho-pneumonia ensues in every case. Similar results are often obtained also after paralysis of the epiglottis induced by section of both vagi in the neck, the saliva and particles of food being thus allowed to enter into the unprotected trachea and lungs.

Except in the latter case, the animals as a rule recover within the second month after the operation (even after sputum inhalations), and if an autopsy is made of an animal killed after the lapse of two months the lungs are seen perfectly normal. When, however, the animal is examined within the first month there is seen an *acute* broncho-pneumonia not distinguishable from that described in man by Dr. Delafield. Throughout the parenchyma of the lungs are seen small nodes, of irregular sizes and outlines, resembling tubercles.

Under the microscope these nodules show to consist of mere unorganized collection of cells, often in a state of retrograde change and mixed with mucus and débris ; this exudate being limited to the lumina of the bronchials and their pertaining groups of air-vesicles (the acini) which they fill. On section these artificial boundaries give rise to the appearance of nodes. Very often epithelial cells and mucus from the bronchi have been seen intermingled with the purulent contents within the air-vesicles ; this suggests that the exudate contained in the latter may have been partly aspired from the bronchi (during forced breathing) and

was lodged in the air-vesicles as foreign material. This appears to be also the case in acute broncho-pneumonia in man. In fatal cases of acute broncho-pneumonia in animals as well as in man abscesses have been met with.

Chronic broncho-pneumonia, however, must be classed with the tuberculosis lesions in accordance with our present knowledge of what constitutes tubercle ; a knowledge to which Dr. Delafield himself has so much contributed in his " Studies."

From the standpoint of a unitory origin of phthisis it is difficult to conceive a definite distinction between *chronic non-tubercular* and *tubercular broncho-pneumonia*, first on account of the too common concurrence of miliary tuberculosis, and further for other reasons stated by Dr. Delafield himself.

As a really refreshing feature of the author's admirable " Studies " must be mentioned yet his sound and unbiassed reference to the tubercle-bacillus question. [H. F. F.]

Psychiatrie : Klinik der Erkrankungen des Vorder-hirnes, begründet auf dessen Bau, Leistungen und Ernährung. Von Dr. THEODOR MEYNERT, Professor der Nervenkrankheiten und Vorstand der Psychiatrischen Klinik in Wien. Erste Hälfte. Wien, 1884. Wilhelm Braumüller.

In an article published in 1878, Professor Meynert incidentally refers to his treatise on psychiatry which he was then preparing for the press. More than six years have since elapsed, and the first half of that work has but just been presented to the medical public. The delay in its publication can not be attributed solely to the author's avowed dislike of book-making ; in part it is undoubtedly due to the careful manner in which Prof. Meynert has sifted his own thoughts, and the facts furnished by others, before putting them to print. Having a distinct message to impart, he knew that, whether published a year or two earlier or later, the originality and worth of his views would not be disputed by others.

To all medical men, and particularly to those interested in the study of the brain, Meynert's name is well known. His anatomical researches rank with those of Clarke, Burdach, and Stilling. Our present knowledge of the relation of the subcortical ganglia to the hemispheres, of the minute anatomy of the cortex, of the tegmentum, and of the projection-systems, is based largely upon the investigations of Meynert. No wonder, that Wernicke, an excellent judge in such matters, should call him " the greatest brain-anatomist that ever lived " !

Of late years Meynert has put his extraordinary knowledge of

the structure of the brain to the best possible use—to the study of the physiological and morbid conditions of that organ. At various times and in various pamphlets he has indicated the nature of the problems he has endeavored to solve. This attempt to strike out on a new line of research in the study of the origin and nature of mental diseases lends special importance to the work before us. The title-page tells its story : Mental diseases are declared to be diseases of the fore-brain, due to disorders in the structure, functions, and nutrition of that part of the encephalon. Former authors, and among them the greatest names in this domain of medical science on both sides of the Atlantic, have studied carefully the clinical manifestations of mental disease, but have never ventured an explanation of the various forms of insanity based upon anatomical and physiological data. A recent writer on this subject condemns every effort to lift the curtain from the mysteries of mind, as premature and imprudent. Meynert is of a different opinion. He thinks there is no need of leaving it to posterity to make deductions from anatomical and physiological discoveries which we have made. New facts should be utilized at once. Mistakes are inevitable, but succeeding investigators will profit by them.

In the very first chapter, on the anatomy of the brain, the author shows his thorough mastery of the subject ; in this section those structures are mapped out and thoroughly explained which have an important bearing upon the study of mental diseases. Those who expect this part of the treatise to take the place of a text-book on cerebral anatomy will be sorely disappointed. Among recent authors, Wernicke, Schwalbe, Luys, and Meynert himself (in Stricker's " Handbook of Histology ") have given more detailed accounts of the minute structure of the brain. Instead of burdening the reader's mind with a vast array of facts, Meynert prefers, in this instance, to have him conceive the brain as a unit, and to have him understand the relative arrangement of its parts. Sufficient embryological data are given to show the development of the adult brain from the primary medullary tube, and more especially the growth of the fore-brain from the lateral appendages of the primary anterior vesicle.

Whether we consider the cerebral structure from an anatomical, physiological, or biological point of view, we must, according to Meynert, distinguish between the cortex and the sub-cortical ganglia ; we must remember that the cortex is the one surface upon which all the impressions from the body and the outer

world are registered, and that the sub-cortical ganglia are way stations, as it were, through which the peripheral nerve-tracts pass on their journey to the cortex.

The division of these nerve-tracts into projection-systems is too well known to be more than alluded to here. The other (intra-cortical) system of fibres—the association-system—plays an important rôle in the physiological and later sections of this book. Professor Meynert has devoted great care to the proper elucidation of these fibres. Lying entirely within the cortex, and forming closely interlacing groups, they can be most clearly demonstrated by having recourse to the old method of detaching the various bundles of fibres from their proper connections, without creating artificial divisions. Forel has been loudest in his objections to this "detaching" method (Abfaserungsmethode). It may prove a dangerous weapon in the hands of an amateur anatomist, but not when practised by Burdach or Meynert. The author's preparations, of which excellent drawings are given in the book, convince one of the truth of what they are intended to express.

Meynert has deprived cerebral anatomy of much of the mystery which once attended it.

Of great interest in the chapter still under consideration are the brief allusions to the cause of variation of cerebral structure among the different species of animals. Thus he clearly shows that the greater or lesser development of the fore-brain is the controlling factor in shaping the entire cerebral mass ; that upon such variations in development depend the relative size of the *pes pedunculi*, of the pons and the pyramidal tracts, and indirectly the appearance or (apparent) disappearance of the *corpus trapezoides* and olivary body in animals and man.

Excellent as this chapter is in all other respects, we regret that it was not revised shortly before the appearance of the first half of this work, for during the last few years Forel, Schwalbe, v. Monakow, and particularly Roller, have added greatly to our knowledge of the minute anatomy of the brain. It is barely possible, however, that Meynert will refer to the conclusions of these investigators in an appendix which he promises to issue with the second half of the volume.

From the chapter succeeding the one just reviewed, the student of psychology, as well as the medical man, may reap a rich harvest. As in the anatomical part, so here the intimate relations between the cortex and the sub-cortical ganglion is forced upon

our attention.   There is a *functional* relation corresponding in importance to the *anatomical* relation between these parts.   The normal functions of the *cortex* are considered first.   Once having accepted Bell's law of the centripetal and centrifugal conducting-power of the posterior and anterior nerve-roots respectively, the author shows that we need merely postulate the sensitiveness of the cerebral nerve-cell in order to gain an insight into the cortex as the organ of intelligence.   Allowing the cortical surface of the child's brain to be a *tabula rasa*, let us suppose that it (the child) meets for the first time a bleating lamb.   Through the various parts of the projection-system two impressions are carried to the cortex : a visual image of the lamb, and an auditory image of the sound it produced.   These images, we have good reason to believe, will be stored in different parts of the cortical surface ; as there is no irradiation (practically) in the gray substance of the cortex, the cells, harboring these impressions, would be anatomically and functionally separate but for the presence of the association fibres connecting them.   Such an association, once formed, is a permanent one, and one of these images cannot be excited without recalling the memory of the other.   The cerebral cortex is practically a storehouse of such visual, auditory, and other images.   An association group may comprise any number of distinct images or memories.   Thus, as the author puts it, a child that has burned its fingers in a flame will add to the visual memory of the flame and to the memory of the painful tactile sensation, the memory of the reflex effort to withdraw the hand from the flame.   Here the memory of muscular innervation comes into play ; and later on the author shows that voluntary movements of which a higher animal that lacks cerebral hemispheres is incapable, are simply effected by re-exciting the impressions registered in the cortex of the previous innervations of certain groups of muscles from the sub-cortical centres.   The sum of all such impressions constitutes what we call intelligence.   These impressions are scattered over different parts of the entire brain, and hence intelligence must be said to result from the activity of the entire cortex, and not from any part of it.   To the development of logical reasoning from the intensity and frequent excitation of definitely associated groups of impressions we can only allude in passing.   The explanation furnished of aggressive and repulsive movements has a more direct bearing upon mental diseases.

These are intimately connected with pleasurable and painful emotions.   Relying upon the experiments of Schiff and Goltz,

Meynert insists that in the case of the decapitated frog, pinching the leg not only causes reflex movements, but that the greater the irritation the greater the resistance offered in the gray substance of the spinal cord to the conduction of the irritant impulses, and that consciousness, when present, recognizes this inhibition as a painful sensation. Furthermore, it has been shown that repulsive movements are attended by a contraction of the blood-vessels of the spinal-cord segment through which the sensory irritation passes ; this in turn causes what the author calls the dyspnœtic phase of the nutrition of the nervous elements. Aggressive movements, on the other hand, are produced by very slight friction (Goltz's croak experiment), are accompanied by pleasurable sensations, due to the unrestricted passage of nerve force, by a functional hyperæmia, an apnœtic phase of nutrition, and so on. Pushing still farther in this direction, the author shows that an actual external irritant impulse is not needed to start this complicated mechanism, but that the mere memory of a former pain may be sufficient to cause a repulsive movement and all its concomitant states. Let those to whom these views appear fanciful look up the full arguments in the book itself before passing judgment upon them. This chapter and the following, on the nutrition of the brain, are full of interesting suggestions to which even numerous extracts would do but scant justice.

In the short chapter on the clinical manifestations of prosencephalic disease, the first practical application is made of anatomical and physiological principles as laid down in the preceding sections of this volume. A few difficulties meeting us at the outset are frankly stated : First—Symptoms due to sub-cortical irritation may screen cortical *lesion-symptoms* (Ausfallserscheinungen). Secondly—Symptoms equal in severity to true lesion-symptoms may be due to irregularities in the nutrition of an otherwise healthy part.

It will be a surprise to many to find predisposition to mental disease put down among the lowest forms of anatomical disorders. I question very much whether in all cases of mental troubles, and particularly in those with a strong *inherited* tendency to disease, it will be possible to assign an anatomical reason ; but Meynert ascribes the predisposition either to some injury to the head during parturition and consequent malformation of the skull, or to the constitutional structural anomalies attendant upon anæmia and other such causes. Whether successful or not, the attempt to define the exact nature of predisposition to disease is a creditable one, and deserves to be extended to other domains of medical science.

In considering functional disorders we must again discriminate between the cortex and sub-cortical centres. The first effect of a change toward defective nutrition of the cortex is a loss of cortical inhibition ; as soon as this inhibitory force is removed the play of the sub-cortical centres begins ; hallucinations and deliria are the result. *Irritation* of the sub-cortical centres may bring about the same result, while a *weakening* of the sub-cortical functions produces an increase of cortical power. Meynert explains this in the following way : Supposing that general anæmia of the brain has produced exhaustion of the hemispheres and of the sub-cortical vaso-motor centres, then a paretic condition of the arterial muscular walls will ensue, and the result is hyperæmia of the cortex. As long as the condition lasts we get a full complement of maniacal symptoms, viz. : pleasurable mood, an abundance of loosely associated ideas and innumerable motor impulses. By finally causing an arterial hyperæmia in the vaso-motor centre itself, this condition works out its own salvation ; the vessels of the cortext contract normally again, and the maniacal symptoms disappear. If this process (of vaso-motor irritation) is carried to the extreme the contraction of the cerebral vessels will become more intense, and all the symptoms of a melancholic mood will be developed.

From the explanation given of normal cortical functions, it is evident that irritation of the cortex could never produce any thing but abnormalities of thought—insane ideas—and pathological emotions ; but the latter have been shown to be mere intensified perceptions. We have already so far exceeded the limits of a review that we can not now dwell upon the manner in which, as the author shows, insane ideas and pathological emotions react upon each other ; nor do more than quote the opinion of Meynert (not peculiar to him, however,) that insane ideas are never newly formed ; that the insane subject (with defective cortical inhibition) simply reproduces such primitive ideas as a child possesses that has no proper appreciation of the relation of its own individuality to the surrounding world. The exaggerated or otherwise defective notions of the normal child are limited and corrected by experience.

The quintessence of Prof. Meynert's views is embodied in his *natural* system of classification of diseases of the fore-brain. It would be an injustice to the author to criticize or even to discuss this classification until after the publication of the clinical portion of the work. If the second instalment of this book will redeem

the promises of the part we have reviewed, Prof. Meynert's trea-
tise will form a landmark in psychiatrical literature.

For the benefit of those who will be puzzled by the labyrinthic
sentences of the original, we add that an English translation of
the book will soon be published by Messrs. G. P. Putnam's Sons,
of this city, with the coöperation of a London firm.   [B. S.]

Leçons sur les Maladies Mentales. Par le docteur B.
BALL, Professeur à la Faculté de Médecine de Paris.   Asselin et
Cie.   Paris, 1883, pp. 884.

The years 1883–84 will remain remarkable for the appearance
of an extraordinary number of treatises and text-books on men-
tal diseases—a flood apparently out of all proportion to the de-
mand, and certainly not justified by any special advance in our
knowledge of cerebral physiology or pathology.   Besides the work
before us, we may mention, as a partial list of these new books
or editions, Krafft-Ebing's "Lehrbuch der Psychiatrie," 2d edi-
tion, 1883 ; Spitzka : "Insanity ; its Classification, Diagnosis,
and Treatment," New York, 1883 ; Hammond : "A Treatise on
Insanity," New York, 1883 ; Mann : "A Manual of Psychological
Medicine," Phila., 1883 ; Hamilton : "Types of Insanity," New
York, 1883 ; Neumann : "Leitfaden der Psychiatrie," Breslau,
1883 ; Clouston : "Clinical Lectures on Mental Diseases," Lon-
don, 1883 (American edition, Phila., 1884) ; and Meynert :
"Klinik der Erkrankungen des Vorderhirns," Bd. I., Wien, 1884.
There are, doubtless, others, but this partial list is surely enough to
appall the would-be thorough student of psychiatrical literature.

The work before us is, perhaps, the most purely clinical of all ;
it is scarcely pathological, and not at all psychological.   It aims,
in beautifully clear, concise, often epigrammatic French, to de-
lineate insanity as the physician will see it.   Shall we say that it
is even more clinical than a work written by a man brought up in
the strict asylum hierarchy would be ? This would not be an ex-
aggeration, and would find its explanation and justification in the
well-known fact, that Prof. Ball was a master in ordinary clinical
medicine before he began treating psychiatry.   The scientific
alienist may find great gaps in his work, but the practising phy-
sician will turn to it with ever-renewing pleasure and profit.   The
work is divided into forty-five lessons or chapters, and is, in
reality, a double book, for, up to chapter xxi., the author describes
morbid mental states as classically designated by the French
school, while beyond this point he takes up the systematic de-

scription of the forms of insanity according to a classification of his own, which is (and the author admits it) based on the same etiological and pathological principles as that of Morel. Ball groups insanities as follows :

1. Vesanic or essential	.	$\left\{\begin{array}{l} \text{Circular insanity,} \\ \text{Monomanias.} \end{array}\right.$
2. Neuropathic	. .	$\left\{\begin{array}{l} \text{Hysterical,} \\ \text{Epileptic,} \\ \text{Choreic, etc.} \end{array}\right.$
3. Diathetic	. . .	$\left\{\begin{array}{l} \text{Gouty,} \\ \text{Rheumatic,} \\ \text{Tubercular,} \\ \text{Cancerous,} \\ \text{Anæmic, etc.} \end{array}\right.$
4. Sympathetic	. .	$\left\{\begin{array}{l} \text{Genital,} \\ \text{Cardiac,} \\ \text{Gastro-intestinal,} \\ \text{Pulmonary, etc.} \end{array}\right.$
5. Toxic	. . .	$\left\{\begin{array}{l} \text{Alcoholic,} \\ \text{Saturnine,} \\ \text{Morphinic, etc.} \end{array}\right.$
6. Organic, or cerebro-spinal		$\left\{\begin{array}{l} \text{General paralysis,} \\ \text{Aphasia,} \\ \text{Acute delirium,} \\ \text{Dementia with hemiplegia, etc.} \end{array}\right.$
7. Congenital	. .	$\left\{\begin{array}{l} \text{Idiocy,} \\ \text{Imbecility,} \\ \text{Cretinism.} \end{array}\right.$

The author does not attach overmuch value to this classification, but claims for it that it will meet the want of the clinician.

In chapters xvi.–xviii. the causes of insanity are well discussed. The great importance of inheritance, when rightly conceived, as a part of evolution, is broadly and strongly sketched. Other causes are classified as general and exciting. Among these injury to the head takes rank as most important. The efficacy of moral causes, especially that of the struggle for existence in a complex civilized state, acting on predisposed organizations, is admitted. General paralysis may result from injury to the head. In another place (chapter xxviii.) the author agrees with Maudsley in thinking that this disease may be caused by conjugal sexual excesses.

The pseudo-general paralyses from lead, from alcohol, from syphilis, and from pellagra, receive attention.

Alcoholism and its numerous psychic manifestations receive what might at first sight seem an undue share of attention ; it oc-

cupies chapters xxx. to xxxiii. But if one considers the extraordinary increase of alcoholic excesses in France (and other parts of Europe) in the last twenty years, and its ever-increasing influence as a direct and indirect factor in insanity and race-deterioration, this is justified. Dipsomania is recognized as a morbid state.

General paralysis occupies chapters xxxv. to xlii., inclusive, and is very well treated.

Dr. Ball's therapy of insanity is not encouraging. He has no optimism, and is evidently much influenced by his faith in the degenerative nature of many forms of insanity. Baths, warm and prolonged, and irritant baths, he favors. Opium and morphia are seldom beneficial. He recommends the bromides in melancholia, in epileptic insanity, and in insanity based upon hysterical states. Hyoscyamia is not mentioned, and chloral is said to be the best of all sedatives.

Seclusion is strongly advocated, either at home (imitating asylum conditions) or in institutions.

Non-restraint finds no favor in our author's eyes. He has evidently not seen for himself how perfectly the system works in Great Britain, Germany, and Switzerland, though a week's absence from Paris would have enabled him to do this. He would mechanically restrain suicides and destructive patients. He justly condemns giving chloral and morphia simply to insure quiescence, and probably overestimates the frequency of this practice in asylums.

The work will well repay study, though it is perhaps too bulky for translation. [E. C. S.]

Archives of Medicine.

Original Articles.

ARE THERE SEPARATE CENTRES FOR LIGHT-, FORM-, AND COLOR-PERCEPTION?

By SWAN M. BURNETT, M.D.,

WASHINGTON.

THAT knowledge of the external world, which comes to us through the medium of the organs of vision, has been broadly divided into three classes : 1, the perception of light or the sense of illumination ; 2, the sense of form ; and 3, the sense of color.

As the phenomena of each of these classes have pretty clearly circumscribed limits, and can, under ordinary circumstances, be sharply differentiated from each other, they have gradually come to be looked upon in some quarters, as distinct senses; correlated, perhaps, but still essentially independent of each other.

The first to distinctly put forth the idea of a separate existence of white light was Hering, in his theory of the perception of colors. As is well known, this theory rests on the supposed antagonistic action of red and green, and blue and yellow light, and of white light and its opposite, black, on three distinct chemical elements supposed to exist in the retina. Later, Steffan and others embraced the idea, and very recently the views in regard to the separate cerebral centres for each have been formulated and put forth systematically in a brochure by Dr. Hermann Wilbrand.[1]

[1] "Ophthalmatrische Beiträge zur Diagnostik der Hirnkrankheiten," Weisbaden, J. F. Bergmann, 1884, p. 100.

In this monograph the ground is taken that there are three separate and distinct centres in the brain for the perception of light, form, and color. His theory is ingeniously defended by cleverly constructed diagrams, and an appeal to clinical facts. It has received wide attention among ophthalmologists, and will, probably, on account of its plausibility, meet with an acceptance more or less general. On this account, it has seemed to us important to examine somewhat into its merits, and to see how far it is in consonance with the principles of positive science and clinical observation—for, an acceptable theory on any question involving physics and physiology, must satisfy the demands of both.

It is sought, by this theory, to explain certain phenomena of abnormal vision which have been found associated with affections of the brain. These phenomena are : 1, The absence of the perception of color, the senses of form, and light being intact ; 2, the absence of color- and form-perception, the sense of illumination being left ; 3, the total abolition of the sense of vision when light-perception is destroyed.

In an attempt to explain these clinical manifestations, the following facts are to be remembered, stating them in an inverse order to the above : 1, that the sense of light is never lost without a concomitant disappearance of the senses of form and color; 2, there is never a loss of the sense of form without an associated loss of the sense of color—with an apparent exception which we shall notice later ; 3, the sense of color may be lost, while the senses of form and light are intact.

Wilbrand attempts to explain these facts in the following manner : As the sense of color may be lost while the senses of form and light still remain, he argues that there must be a centre somewhere which presides over this sense, and that this centre must have an independent connection with

the retina. For the same reason, the sense of form must also have an independent centre with a connection with the retina, independent of that of the centre for light and color ; and, similarly, there must be an independent centre with a separate connection for light-perception.

That is all simple and plausible enough, but in order to explain the facts of the unvarying succession of phenomena as described in the preceding paragraph, it has seemed to him necessary to assume a certain connection between the three fibres connecting the centres with the retina. As the sense of light is never lost without carrying with it a loss of the other senses, it is assumed that there is a fibre going from the retina to the cerebral centre which is common to all three, and as it is supposed that the sense of light comes first in the order of centres, an abolition of this centre must necessarily mean an abolition of the other senses, since all the centres are thus cut off from their connection with the retina. When, however, the centre for color alone is destroyed, or hindered in its function, the connection at the centres of form and light are left intact and these senses are unimpaired. When the centre for form is destroyed, the centre for color being cut off from its connection with the retina, its function is also destroyed, and the centre for light alone remains unimpaired.

But in addition to this fibre common to all three centres the centre for form has one which connects it with the centre for light and the retina, and the centre for light has one which connects it independently with the retina. As a result of this arrangement each separate cell in the centre for color has a single fibre bringing it in communication with the retina, which it shares in common with the centres for form and light ; the centre for form has two, one in common with the centre for light and color and one in common with the centre for light alone ; the centre for light

three, one in common with the centres for form and color, one in common with that for form, and one direct and independent of the other centres. From every percipient point in the retina, therefore, there go three separate fibres to the centre of vision in the brain : one to the centre for light, one to that for form, and one to that for color, with the connections above stated.

Into Dr. Wilbrand's scheme there enters an arrangement of the fibres and cerebral cells with reference to the different parts of the retina; but we shall have nothing to do in this paper with any points unconnected with the idea of three separate centres for light, form, and color.

It cannot be denied that this is an arrangement by which it is *possible* to explain the phenomena in question, but it is certainly not in the spirit of modern science to accept such an explanation without some proof, either positive or analogical, on which to base it. The proof in question can only be found in the application of the laws of wave motion as manifested in the domain of molecular physics, in experimental physiology, and demonstrated pathology. Such proof is as yet wanting. The whole scheme is a figment of the imagination, and is furthermore a species of speculation which, if allowed to become common in ophthalmology, will tend to depose it from the high stand it has taken as the most nearly positive part of the science of medicine. It shows, also, to what lengths we may be led when once we lose our hold on the positive data of science, and no longer rest on the basis of fundamental principles.

So far as the physical part of vision is concerned we know that it has to do with wave motion of ether, and the action of this on the ultimate particles of the matter of which the organ of vision is composed. We can afford here to leave undecided the question of the existence, or not, of fibres going from the retina to the brain. No such continuous

structures have yet been demonstrated, but the possibility of a single fibre connecting an ultimate molecule of the retina with one in the brain will not perhaps be denied. It would, however, very much simplify a study of the case if we referred the whole matter to the action of wave motion on a homogeneous structure. If we are to accept Wilbrand's scheme, however, we have *three* distinct fibres connecting every *recipient* element at the retina with every *percipient* element in the brain. That would make sufficiently large draughts upon the physical capabilities of the structures involved, but they are doubly increased if we add the three fibres for the three fundamental colors, as demanded by the Young-Helmholtz theory, making *six* fibres from every element of the retina to every element in the brain.

Such fibres, as every one knows, have not been demonstrated, but it does not seem to have occurred to investigators to question the necessity of their existence, and to seek an explanation more in keeping with the demonstrated laws of wave motion as applied to homogeneous molecular structures. We have endeavored in another place [1] to bring these laws to bear on the elucidation of the question of color-perception.

There is nothing so delicately elective as wave motion in a structure whose molecules are properly adapted in their arrangement to this display of its powers. In such a structure any number of different vibrations will pick their way safely and without the least interference with one another, through long distances. [2] No one, we presume, will contend for a separate fibre in the small wire of the telephone for every distinct note which goes to make up the human voice in speech, and yet the retina and optic nerve, which are highly organized structures, have not more required of

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[1] "Theories of Color-perception," *Amer. Jour. Med. Sci.*, July, 1884.

[2] Of course it is not contended that these wave motions are transmitted singly as such, but every variation in wave motion is felt in the resultant effect.

them in this particular than the inorganic and (so far as we know) homogeneous substances of which the telephone is made. We have in the organ of vision molecular structures acted on by wave motion, why then, in explanation of the phenomena resulting from this action, should we go beyond the laws which have been clearly demonstrated to apply to similar phenomena in the inorganic world?

When we come to consider the question of three separate centres in the brain, we have passed, it is true, the bounds of physical science, and have to deal with a physiological function and a psychical phenonenon, but even here, we cannot in our attempts to form a theory legitimately go outside the laws which have been found to govern like phenomena.

Let us reduce the physiological and psychical phenomena of vision to their simplest terms. What are light, color, and form? The difficulty with those treating of the subject heretofore has been, it seems to us, that they have not been able to free their minds from the metaphysical system of thought. The words, light, color, and form, are regarded as *entities*, and as having existences in fact, and to be accounted for as such. It is strange that we should have this remnant of the old school of thought engrafted on the positive system of modern science, and ophthalmology is not the only department of thought that has felt its ill-effects.

The phenomena of vision are but the interpretations of impressions made on the retina and carried thence by means of the optic nerves to the brain. Light is only the translation of wave motion into sensation.[1] How this is effected

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[1] Plato defined light to be " the power that through the eye manifests color." The same idea (which is the true one), is also expressed by Ruskin in his own inimitable way in one of his latest utterances ("The Storm-cloud of the 19th Century," two lectures delivered at the London Institution, 1884). " Light and sound are *sensations* of the animal frame which remain and must remain wholly inexplicable, whatever manner of force, pulse or palpitation may be instrumental in producing them ; nor does any such force *become* light or sound

we do not know. But we do know that when waves of ether of all the lengths which are capable of being perceived act at one and the same time, we have a sensation called *white ;* when a limited number or a single wave acts, the sensation is known as *colored.* We know further, *that there is no white light sensation that cannot be resolved into its constituent elements of color-sensation.* In the language of physics, there is no white light that cannot be broken up by the prism into the spectral colors.

White and color, then, being expressions of the effects of wave motion, differing only in degree, cannot be looked upon as distinct sensations. *Moreover, since the whole must comprehend all its parts, white light must include all colored light.*

To suppose a separate cerebral centre for the two, therefore, seems to us about on a par with the proceeding of the philosopher who cut a large hole in his door to admit the cat and a number of smaller holes to admit the kittens.

The sense of form, as far as it pertains to the organ of vision, is but the expression of the idea of extension as represented by the amount and form of the area of the retina impressed. But to call the idea of form a purely visual sensation is erroneous. It is an expression of the judgment which is based on information received by the brain from other sources besides the eye.

The impression received from the retina must be verified by that given by touch before a correct idea of form can be entertained. Long experience has enabled us to supply from memory this second factor, and in ordinary vision, our judgments are formed from the retinal impressions alone, but it is only a process of education which enables us to do it.

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except in its recontre with an animal. The leaf hears no murmur in the wind to which it waves on the branches, nor can the clay discern the vibration by which it is thrilled into a ruby."

To use again the terms employed in physics, light (comprehending color) is a *qualitative* sensation, form a *quantitative* sensation. Light and color are the judgments formed on the basis of the character and number of the ethereal undulations ; form is the idea based on the extent of the retina affected, together with the knowledge previously or concomitantly obtained through the muscular sense and the sense of touch. As has been stated before these ideas are only the translations of impressions carried to the brain—but is it necessary that there should be a separate centre for their perception ? As these ideas are but states of consciousness we would have as much right to suppose a centre for every one of the other million states of consciousness that happen daily in our lives.

In order to avoid a labyrinth of complications we must assume that there is an overruling power of judgment, which takes cognizance of all impressions received, which combines and discriminates, and finally leads to the condition we denominate consciousness. That there is a certain portion of the brain set apart for the reception of particular kinds of impressions is a plausible induction, and is support by many facts in experimental physiology and in pathology. Thus, it is almost certain that there is a particular part of the cortical substance of the posterior cerebral lobe which is intimately connected with the sense of vision, for when it is destroyed the power of seeing is lost. Such a centre will suffice for the reception of all impressions made on the retina, but when we seek to explain how these impressions are interpreted by the faculties of the mind we pass the boundary of physics and physiology, and enter a region concerning the essential nature of which we are in absolute ignorance.

Up to this point, however, we can legitimately go with our wave motion and molecules, in an attempt to account for the phenomena.

Making an application of these laws of wave motion, then, can we consistently explain the three conventional divisions of the visual function—viz: light-, color-, and form-perception—on the basis of one cerebral centre for all? From our point of view, the task is not at all a difficult one. We have already noted the physical impossibility of separating white and colored light on account of the demonstrated fact that white light includes the colors, and that there is no colored light which is not contained, potentially, in the white.

We will assume, for the sake of illustration, that each individual element in the retina has a corresponding element in the cerebral centre, with which it is connected by a single fibre. When one of these retinal elements vibrates in a certain phase, which is set up, we will say, by the ethereal undulation corresponding to the sensation of red ; this vibration is conveyed to the cerebral centre, and the corresponding cerebral cell vibrates in the same phase—resultant sensation, red. The same retinal element vibrates to the phase green—which vibration is repeated in the cerebral element —resultant sensation, green. The retinal element vibrates with the ether wave, producing blue ; this, repeated in the cerebral cell, gives rise to the sensation of that color ; and so on for yellow and all the other distinguishable colors. Let these ether waves, and all the others corresponding to the colors in the solar spectrum fall upon the element at the same time, and the *resultant* vibration phase (according to well-demonstrated laws of physics) will be different from any, and all combinations short of the whole as they differ from each other ; this vibration phase, carried to the brain, is reproduced by the cerebral element ; resultant sensation, white.

This explanation is simple, in strict accordance with the known laws of the physics involved, and thus fulfills all the requirements of an acceptable working hypothesis.

The idea of form, so far as it comes from the eye, is simply explained by the sensation resulting from the *number* of the cerebral elements (corresponding to the number of retinal elements impressed) affected, and their relations to each other in space.

We have, therefore, in this scheme, but one set of cerebral elements corresponding to the retinal elements on which the impressions are primarily made.

We have not time nor space to enter into an elaboration of this hypothesis in explanation of all the various phenomena of normal and disordered vision. We shall only notice a few manifestations which the scheme of Wilbrand was constructed to explain. These phenomena, as we have noted at the beginning of this article, are the absence of color-sensation (generally in one half of the retina), the sense of form and light being intact, and the presence of the sense of light when both color- and form-sensation are absent. These phenomena are accounted for by W. on the supposition of a destruction in the first instance of the centre for colors, leaving the other two centres unharmed; and, in the second instance, by a destruction of the centres for both color and form, that for light remaining intact.

Cases of hemi-achromatopsia, or defective color-sense in corresponding halves of each retina, are not uncommon. The defect may be partial or complete—that is, some of the colors may still be properly perceived, or it may be impossible to recognize any. Wilbrand gives the clinical histories of six such cases in more or less detail, and the histories of two other cases of " amnestische Farbenblindheit," in which there existed a want of power to express in words correctly the color sensations. Several other cases have been reported which are not in W.'s list,[1] and among them one by Dr. Eperon in the *Archives d'Ophthalmologie*, for July and

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[1] Shoeler reports eight (*Beit. z. Path. d. Shenerv.* 1884), and Noyes two (*Arch. of Oph.*, vol. XI.).

Aug., 1884, which is of especial interest on account of the very careful and complete examination to which the patient was subjected, and on account of a peculiar derangement of other cerebral functions. In all these cases there was a diminished or abolished chromatic sense alone, or combined with loss of form sense, while the sense of illumination remained. This fact in reference to these cases, is to be noted, however, that in none of them, except that of Eperon, was any photometric examination made. Eperon found, in his case, the sense of illumination reduced to $\frac{1}{9}$, and until such examination in other cases reveals a perfectly normal sense of illumination, we cannot accept it as a fact that in complete hemi-achromatopsia there is no diminution of the light-sense. On the other hand, in some of the cases, it is distinctly stated that it is reduced.

In congenital, so-called, color-blindness we have, as a rule, normal visual acuteness, but it is to be remembered that here we are undoubtedly dealing with errors of judgment and not with a pathological condition of the nerve centres.

When there is a pathological alteration in the cerebral centres, its effect must be felt on its molecular structure—in fact, that is the essence of pathological change. The effect of a pathological change in the molecular structure at the centre for vision would, most naturally, be an impairment of the power of the molecules to respond promptly and readily to the wave motions corresponding to the different colors. It is readily understood how delicately organized must be the molecular structure in order that it respond to such very slight variations in wave motion, and how easy it would be to throw it out of its equilibrium. It can also be easily understood how this change in molecular structure might be such as to prevent it from responding to certain wave lengths, while it would be affected by the force of the vibration movement of the whole spectrum acting at once.

On this simple conception is it possible to explain all the phenomena of hemi-achromatopsia that have, as yet, been observed.   Moreover, we have a parallel condition in affections of the choroid and retina in which the retinal structure is no longer normal in its molecular arrangements.   In a case of extensive choroidal changes which I recently examined there was perception of light over the whole of the visual field, and in the outer, lower and part of the upper inner field there was color-perception which did not depart very markedly from the normal, but in the lower inner field there was no distinguishing of colors.   And with this loss of color-perception there was associated in this part of the field a diminution of the sense of illumination. The white square of the perimeter appeared to her to be much " brighter " in the outer and upper and inner field than in that portion where there was absence of color-sensation. In another case of extensive choroidal disease where the visual power was reduced to counting fingers at two feet, there was an irregularly concentric contraction of the field for white. In this field no colors were distinguished except red, which, however, had a " pinkish tinge," and was only recognized in the outer field near the point of fixation.   In both these cases the fellow eye was normal.   We, therefore, do not believe that there can be an absence of color-perception from pathological causes without a concomitant lowering of the sense of illumination of a greater or less degree. We can conceive it possible, however, that the molecular disturbance may be so slight as to affect perceptibly one or two undulation phases only, the others remaining unaffected. Under these circumstances the sense of illumination might not be much lowered and form-perception intact.

In reference to Eperon's case, it should be remarked in addition, that there was an impairment of judgment in respect to the memory and power of reproducing words

that had been *read*, though those that had been *heard* were
more easily repeated. How far this change had affected
the judgment of color impressions we have no means
of knowing, but it must nevertheless remain a possible
factor in the case.

It is a clinical fact, brought out clearly in the cases col-
lected by Wilbrand and others, that when the sense of form is
lost the sense of colors is lost also, though the sense of light
may remain. No case has yet been reported where the
sense of form has been lost while that of light and color
remained. Wilbrand accounts for this by supposing that
the color fibre going from the retina to the brain passes
through the centres for white and form before reaching the
centre for color. Therefore, a destruction of the form-
centre, must, by cutting off the connection between retina
and color-centre, necessarily involve a loss of color-percep-
tion.

The concomitant loss of form- and color-perception is
much more simply accounted for on the principle of varia-
tion in molecular motion. A moderate amount of change
would so alter the responsive power of the molecules that
they could not act promptly to the waves of the different
colors, but yet their position and relation to each other
may remain nearly or quite normal, so that when they
are affected by all vibrations of the spectrum at once
the resultant sensation will be projected nearly or quite
in a normal manner. When, however, the change is so
great as to displace the molecules from their normal
position, but not entirely to annul their vibrating power,
the vibrations still give rise to a sensation, but the position
of the vibrating molecules in their relations to each other is
so altered from the normal that they cannot be properly
projected by the consciousness, and so no distinct image is
perceived, though there may be a general sense of illumina-

tion. The condition has its analogue in opacities of the cornea through which ethereal undulations may still pass; but the rays are so scattered that no image can be formed. In order to have a definite sense of form a certain number of molecules in a definite order must be affected. When the sense of illumination is retained under these circumstances it will most likely be reduced very much in power—and no cases have been recorded in which it approached the normal.

In connection with this part of the subject there is a very remarkable statement on pp. 23-24 of Wilbrand's brochure. He says: "A separate irritation of the color-centre, as a physiological experiment, without a participation on the part of the form and light sense, has not yet been demonstrated, but the bright red color sensation we experience when looking toward the sun with the eye-lids closed is explained by a simultaneous excitation of the light and color centres to the exclusion of the form centre. Leber says (Gräfe u. Sæmisch. v. 1042): 'we see not colors but colored pictures, the form element cannot be separated from color-perception and the centre of both must be the same,' but the two above mentioned cases and the experiment with the closed lids show that there must be the clearly defined centre for form and color, though ordinarily in every picture formation all three centres are affected."

It is hard to believe that scientific men are serious when they adduce such opinions in support of an hypothesis for which they claim attention. I would ask these gentlemen how we are to experience the sensation of a form when there is no image pictured on the retina? In the experiment alluded to, light passes through the partially translucent tissues of the lids and reaches the retina—but the rays are so irregularly diffracted from their course that no distinct image can be formed, and there is only a diffuse lumi-

nosity, the same as when light passes through frosted glass. Its red color is of course due to the blood in the tissues through which it passes. But to say that under these circumstances we can have no sense of *space* is not true, for when the experiment is made with a candle the position of the candle in the visual field can easily be recognized because there is always one part of the retina where the luminosity is most intense, and this is properly projected. It is to be borne in mind in this connection that the sense of form is only a more refined or highly developed sense of projection.

We would call attention at this place to another physiological experiment which, it seems to us, will be difficult to explain on the three-centres theory. We allude to the so-called after-images or the residual sensations of white light. When white light, either direct from the sun, or reflected from as nearly a white surface as we can find, is thrown into the eyes for a few seconds, and the lids are then closed and the hands placed over them so as to exclude all extraneous light, the after-image undergoes a series of changes in *colors*, beginning usually with blue and ending with red. In some of the hundreds of these experiments that I have made, I have noted as many as seven different colors and shades; but *never* after the eye is closed has there been a sensation of white. Have we here a sensation of color independent of white light? Certainly not. Even if Newton had never made his immortal discovery, this simple experiment would be sufficient to establish the compound nature of white light, and it removes beyond the pale of controversy the question of the composite character of the sensation of white.

If white light is a distinct sensation, and has a centre of its own, its after-images should be not colored, but shades of gray, because, in Wilbrand's scheme, while a color-sensa-

tion may include white, the converse is not true, and white does not, of necessity, include colors.

The phenomena in question are easily explained by the theory of the action of wave motion on molecules. White light, holding all the undulations corresponding to all the perceivable colors falls upon the retina and the vibrations are carried to the visual centre. These vibrations vary in intensity and amplitude, according to their corresponding colors, but when they all act *at once*, the sensation is white.[1] When the eye is closed, however, and the retina is cut off from the source of illumination, the vibrations already set up in the visual apparatus still continue in accordance with the law of inertia ; but soon some of them stop and then there is a destruction of the equilibrium of the color-forces, the stronger come to the fore, and there is no longer a resultant sensation of white, but of the predominant color or colors. We have not time to examine here into the reason why blue should be the first color to manifiest itself, but it is probably due to the fact that, the blue waves being more rapid, act more quickly and forcibly at the beginning, but are, on the other hand, soon exhausted, while the red, though less active, being stronger and having greater momentum, last the longer.

To sum up, then, we do not think the existence of three cerebral centres for the separate perception of form, color, and white has been proven by either anatomical investigation, physiological experiment, or the manifestations of pathological change. Moreover, we fail to see the necessity for their existence, since all the phenomena of normal and disordered vision can be easily and consistently accounted for on the well-known and abundantly demonstrated laws of wave motion in the domain of molecular physics. In accordance with these laws, one cerebral centre is all that is

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[1] The so-called color-blind, who sees all colors as modifications of two, calls the sum of all his color-sensation *white*.

necessary. Its molecular structure is in a condition of deli-
cate equilibrium, which allows it to answer promptly to all
the vibrations which come to it from the retina—embracing
all those which answer to the colors in the visible spectrum.
It is able to respond in phases peculiar to any one color,
or to any combination of colors, when the resultant sensa-
tion will be of *color*. When the phase of vibration answers
to all the undulations embraced in the solar spectrum, the
resultant sensation will be *white*.

By a process of education we have learned to project the
impressions coming from a certain part of the retina (and
affecting, probably, a certain part of the visual centre) to a
certain position in space. When these projections have a
definite outline we have a sense of *form*.

Unless some phenomena present themselves which can-
not be accounted for on this theory, we contend that we
must, as scientific physiologists, accept it as a working hy-
pothesis until there arise discoveries in the laws of the ac-
tion of wave motion on molecules with which it is inconsis-
tent. Moreover, we hold it to be dangerous to scientific
advancement and truth to promulgate speculations which
have not their bases in these fundamental principles.

THE AMERICAN METHOD OF GIVING POTASSIUM IODIDE IN VERY LARGE DOSES FOR THE LATER LESIONS OF SYPHILIS; MORE ESPECIALLY SYPHILIS OF THE NERVOUS SYSTEM.

By E. C. SEGUIN, M.D.

THE use of potassium iodide in very large doses under certain indications is a slowly spreading practice in this country, and constitutes, I firmly believe, a marked gain in therapeutics. By large doses I mean such as shall make up a total of from 10. (ℨ ijss.) to 40. (ℨ x.) in twenty-four hours.

This practice has been in use in New York for fully fifteen years if not longer, in a small circle of physicians whose experience has tended more and more to establish the reality of the advantages obtained by such dosage. After considerable search, and by means of personal inquiries, I have satisfied myself that this plan is originally American, and that reliable tradition indicates that the promoter and prophet of it was the late Dr. William H. Van Buren. I shall present citations from a considerable number of authorities on this matter of dosage of the iodides, in order on the one hand to establish the claim that the giving of very large doses is an American idea, and on the other hand to show how little help many of our text-books afford students and practitioners on such a vital question.

In most of the works to be cited the doses advised are

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absolutely too small for successful use in syphilis of the nervous system, and no specific directions are given as to the mode of administering it so as to produce the least gastro-intestinal irritation.

In the first place let us see what the leading authorities on Materia Medica and Therapeutics say on this subject.

STILLÉ: Therapeutics and Materia Medica, Phila., 1874, ii., p. 862, referring to McGregor (*Edinburgh Med. Journal*, xv., p. 309——— a mistake) says: " The success of the treatment of tertiary syphilis sometimes depends entirely upon the dose in which the iodide of potassium is administered. Cases which have only become worse or have remained stationary under the usual doses of five grains three or four times a day, will often manifest a decided progress toward cure when ten, twenty, or even thirty grains of the salt are administered at the same intervals."

CHARLES RICE: Posological Tables, N. Y., 1879, p. 62. Dose progressively increased from two to ten and to twenty grains.

SYDNEY RINGER: Handbook of Therapeutics, 10th ed., N. Y., 1883, p. 158. Five grains three times a day is generally a sufficient dose. Much larger doses, from ten, fifteen, or even twenty grains are sometimes required. For the removal of syphilitic nodes from the membranes of the brain, from five to ten grains three times a day are generally sufficient.

STILLÉ and MAISCH: The National Dispensatory, 3d ed., 1884, p. 123, states that the dose of KI varies from two grains upward ; and they refer to ten or twenty grains three.times a day as " very large doses." They make a bare reference to the practice of some specialists in syphilis who give more ——— as high or three hundred grains per diem.

R. BARTHOLOW: Materia Medica and Therapeutics, 5th ed., 1884, p. 228, gives the dose as varying from five to sixty grains.

H. C. Wood : Therapeutics, Materia Medica, and Texicology, 5th ed., 1883, pp, 415–417. States that the ordinary dose of KI is ten grains three times a day. In certain forms of syphilis this may be increased to twenty or even sixty grains.

Trousseau et Pidoux : Traité de Thérapeutique et de Matière Médicale, Paris, 1868, ii., p. 335. Dose from fifteen to sixty grains per diem. On p. 324 they quote Ricord as giving the maximum doses.

Gubler : Leçons de Thérapeutique, Paris, 1877, p. 434. Recommends for adults from one to thirty grains (.05 to 2.) a day. " Small doses " for children.

Nothnagel und Rossbach : Handbuch der Arznei-mittellehre, 3 Aufl., Berlin, 1878, pp. 271–83. The dose is .05 to 1. two or three times a day. In syphilis, consider doses of 2.50 to 3. (forty-five to seventy-five grains) a day sufficient, and larger doses, as 15. (or ℥ iv.), " as recommended here and there," as not at all necessary.

Binz : Vorlesungen über Pharmacologie, Berlin, 1884, p. 211. Iodide of potassium is best administered in aqueous solution : from .10 to 2. (one and a half to thirty grains) to be given in twenty-four hours.

Let us next see what our principal teachers of practical medicine say about this matter.

A. Flint : Practice of Medicine, Phila., 1884. The index of this work contains no reference to spinal and cerebral syphilis, or to iodide of potassium.

R. Bartholow: A Treatise on the Practice of Medicine, 5th edition, N. Y., 1884. On p. 639, speaking of the treatment of syphilis of the nervous system, Bartholow says : " In these affections the most marvellous change is wrought by sufficient doses of the iodide of potassium ; no time is to be lost in its administration, and usually the largest doses are required."

A. L. LOOMIS: Text-Book of Practical Medicine, N. Y., 1884. While treating of syphilis, p. 923, Loomis says that the iodide should be increased to the limit of the patient's endurance, or until the lesion yields to treatment. Again, on p. 956, under the heading of " Pachymeningitis Syphilitica " : " The iodide must always be given in large doses ; from thirty to sixty grains may be given in from four to six ounces of water, three or four times daily until the desired effect is reached, which is the disappearance of the symptoms."

Before quoting syphilographers and other authorities let us go back to the physicians who originally introduced the iodide of potassium in the treatment of syphilis, and get their views.

Dr. ROBERT WILLIAMS, Senior Physician to St. Thomas' Hospital : "Lecture on the Laws and Treatment of Syphilis," *London Medical Gazette*, vol. xiv., 1833–4, pp. 39–45. Dr. Williams used KI as early as 1831 in a case of syphilis which had resisted mercury ; he gave it in doses of five and ten grains in camphor mixture three times a day, with surprising results. In another case of extensive nodes upon the tibiæ and digits, with ulceration, doses of eight grains, three times a day, brought about a cure in two months. After this experience Dr. Williams' average dose in cases of periosteal node was eight grains thrice a day. Beyond that dose it purged (!). The mitigating effects of the drug were obtained in from five to ten days.

To Dr. Williams probably belongs the credit of first using and publicly recommending iodide of potassium in syphilis, but the papers of Dr. Wallace of Dublin (*vide infra*), have attracted more attention, and he is often considered the originator of the method.

Dr. JOHN CLENDINNING, Physician to St. Marylebone Infirmary, London: "Observations on the curative proper-

ties of hydriodate of potass. in periostitis and chronic articular rheumatism," *London Medical Gazette*, vol. xv., 1834–5, p. 833 and p. 866. His usual doses were from five to thirty grains, three times a day. The larger doses were given under the direction of Dr. Elliotson [1] with excellent results.

This was in a case of painful node on the cranium (case 2 of paper): as much as 100 grains a day were given with only good effects. Dr. Clendinning advises that KI should be taken well diluted, "on a full stomach and at no other time." Begins by doses of two or three grains, and rapidly increases. Remarks upon certain untoward effects: sometimes heartburn, nausea, flatulence, and diarrhœa, and rarely ptyalism.

DR. WALLACE of Dublin, "Clinical Lectures on Surgical Cases," *Lancet*, 1835–6, vol. ii., p. 5. Also in the same volume, "Lectures on Diseases of the Skin," etc., pp. 743, 688, and 894. In *Lancet*, 1836–7, vol. I., the same lectures are continued on pp. 428, 487, and 553. The observations were made in the Jervis Street Hospital. Dr. Wallace advocates the treatment of venereal disease by the hydriodate of potass or iodide of potassium ; he employs a simple solution in water so made as to give the patient about thirty grains [2.] in twenty-four hours. Has never seen any unpleasant effects. Is guided in dosage by the reaction of the urine, and does not deem it necessary to give more than will saturate the urine, *i. e.*, give a deep blue-black color-reaction when tested with dilute sulphuric acid, a

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[1] This physician is sometimes (*vide* p. 121) referred to as having been the first to use very large doses of KI., but a reference to the original article, "Lecture on a Case of Scirrhus Uteri," in *Lancet*, 1831–2, vol. i, p. 727, shows that the medicine was not used in syphilitic lesion, but against induration of tissues. The remarks are entitled : "The Hydriodate of Potash ; quantities in which it may be safely given." Dr. E. states that it acts as a diuretic, and that he has used it with success in enlargement of the liver, spleen, bronchocele, and cancer uteri. The patient who was the object of the remarks took ʒ ij. three times a day in weak mint water, for how long a time is not stated. It is interesting, however, as corroborative of our more modern experience that these doses caused no unpleasant symptoms.

small quantity of starch solution, and 1–2 drops of solution of chloride of lime.

In two patients who accidentally took sixty grains a day there were severe symptoms of gastro-intestinal irritation.

In the third place let us consult some writers upon syphilis of the nervous system.

LAGNEAU : Maladies syphilitiques du système nerveux, Paris, 1860, p. 179. Considers quantities of 2. (thirty grains) a day as too small, and that this explains the want of success so often reported. He gives increasing amounts up to 8. (120 grains) per diem.

GROS et LANCEREAUX : Des affections nerveuses syphilitiques, Paris, 1861, p. 460. These authors condemn small quantities of from 1. to 2. (fifteen to thirty grains) a day as next to useless, and recommend from 3. to 10. (forty-five to 150 grains) in twenty-four hours.

ZAMBACO : Des affections nerveuses syphilitiques, Paris, 1862, p. 583. Claims to follow a happy mean between physicians who never give more than .50 (eight grains) a day and still get excellent effects, and those who give from 15. to 20. (250 to 300 grains) in twenty-four hours. His usual limit is 4. (sixty grains) ; in some few cases 6. (ninety grains) per diem.

FOURNIER : La Syphilis du Cerveau, Paris, 1879, pp. 609–610. Begins with 3. (45 grains) per diem and rapidly increases it to 6. and even 10. (90 to 150 grains). Says he has tried the larger doses recommended by " certain physicians," of from 12. to 20. (200 to 300 grains) per diem without any advantage. If the doses he gives are not successful the larger ones will not be (!!).

HEUBNER : Article on " Syphilis of the Brain and Nerves," in Ziemssen's Encyclopedia of Medicine. Amer. ed., N. Y., 1877, vol. xii., p. 369. Recommends " large doses " of iodide from 1. (15 grains) the first day, rapidly increased to 8. and 10. (120 and 150 grains) in the twenty-four hours.

DOWSE : Syphilis of the Brain and Spinal Cord, London, 1879. In chapter v. on treatment gives no doses or mode of administration, but says he has used KI in small and in " excessive doses," but is inclined to be disappointed in his results.

E. L. KEYES : Syphilis of the Nervous System, *New York Medical Journal*, Nov., 1870. This able paper is a product of the joint experience of the late Dr. William H. Van Buren and the author, and is the first one that to my knowledge refers to and recommends the use of really large doses of iodide of potassium. The essay should be carefully studied by all interested in nervous syphilis, but for our purposes it will be sufficient to make only a few citations.

First, that in case 30, seen in February, 1870, in consultation with Dr. William H. Draper, the iodide of potassium was given in large doses, varying from ninety grains (6.) a day to 3 ss. (2.) every two hours in an attack characterized by blindness, convulsions, and stupor, with complete recovery.

As early as in 1861, in case 31, Dr. Van Buren gave as much as sixty-seven and a half grains (4.5) three times a day with success.

Conclusion 14 of the essay states our own view of the utility and mode of using KI exactly : "That the iodide of potassium pushed rapidly to toleration, unless the symptoms subside before that point is reached, is the main outline of treatment. That mercury, used at the same time, or alternated with the iodide of potassium, is often of great value in protracted or inveterate cases; and that tonics, change of air and surroundings, frequently influence the effect of treatment in a marked degree, and may become essential to success."

BUZZARD : Clinical Aspect of Syphilitic Nervous Affections, London, 1874, p. 134. " A word as to the dose of

iodide of potassium.   After a good deal of hesitation and
trial of various quantities in a considerable number of cases,
I feel convinced that in syphilitic affections of the nervous
system it is often necessary to employ doses of this drug
which are far beyond those usually ordered.   In several
instances I have observed something of the following kind
to take place.   An improvement up to a certain point has
been produced by doses of iodide of from ten or fifteen to
twenty grains three times daily.   The patient has then re-
mained at this stage, or progress has been very slow, whilst
he continued to take this amount.   On increasing it, how-
ever, by rapid steps, to thirty, forty, sixty, or even ninety
grains three times a day, the case has responded immedi-
ately and *pari passu* to the additional quantity of the drug.
I had two patients in the hospital last year who were strik-
ing instances of this effect.   In each the dose was pushed
gradually to ninety grains three times a day with marked
beneficial effects, and I may add that the patients them-
selves expressed an unhesitating opinion upon this point.
There is nothing new of course in the employment of large
doses.   Forty years ago the late Dr. Elliotson used to give
as much as ℥ ij. (8.) three times a day, and with remarkably
good results.[1]   But of late years, as a general rule, the dose
has been so moderate that to many practitioners the em-
ployment of ten grains at a time is only gradually arrived
at and with some caution.   No doubt in a very large num-
ber of cases a comparatively small dose is all that is re-
quired, and in practice, therefore, it is well to begin with a
dose of ten grains, and increase it if necessary.   I feel tol-
erably sure, from repeated experiments, that the iodide may
be used, if occasion requires it, as freely as the bromide of
potassium, and that the opportunity of doing great good in
syphilitic nervous affections is nearly as often missed by the

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[1] Not in syphilis, *vide* foot-note on p. 118.

employment of inadequate doses of the former drug as used notoriously to happen in respect to epilepsy from the exhibition of too small doses of the latter.

"I am in the habit of administering the drug simply dissolved in water, and have not found that any advantage is gained by the addition of ammonia or vegetable bitters." (Time of administration with respect to meals not stated.)

I have quoted thus largely from Dr. Buzzard because he is the only European writer who has had the intelligent courage to disregard tradition and give KI in doses sufficient to attain the results aimed at. He is mistaken in his reference to Elliotson, but was probably misled by some other author or by tradition in London medical circles.

Let us now seek the opinion of syphilographers.

RICORD'S doses, as cited by Trousseau and Pidoux (i., 324), were from 1. to 4. (fifteen to sixty grains) in twenty-four hours.

LANCEREAUX: Traité de la syphilis, Paris, 1873, p. 558. Recommends doses of from .50 ($7\frac{1}{2}$ grains) to 4. (60 grains), and even 6. (90 grains), in twenty-four hours. Denies the efficacy of quantities of 10. (150 grains) to 15. (240 grains) a day, as recommended by "some authors." The astounding reason assigned for this is that the system never utilizes more than a fixed quantity of any medicament (!).

VAN BUREN and KEYES: A Practical Treatise on the Surgical Diseases of the Genito-Urinary Organs, N. Y., 1875. These authorities (pp. 569–70) give no limit to doses; they employ (usually) a saturated solution of the iodide in increasing doses until the symptoms yield or the patient can bear no more. They cite a case in which 64. (℥ ij.) were taken daily for two weeks, with the result of checking an ulcer of the throat. They advise giving the drug after meals.

BUMSTEAD and TAYLOR: The Pathology and Treat-

ment of Venereal Diseases, fifth ed., Phila., 1883. When
speaking of the treatment of syphilitic affections of the ner-
vous system, on p. 712, the authors urge that there is no
time for half-way measures. "If the patient has not al-
ready taken the iodide of potassium, it may be well to
commence with the moderate dose of 1. (fifteen grains)
after each meal, for fear that he may be one of those excep-
tional individuals in whom the iodides exercise a poisonous
influence, and if he is found to bear it well, the dose should
be rapidly increased. But when his tolerance has already
been tested, a dose of 2. (thirty grains), or, in urgent
cases, even of 4. (sixty grains) three times a day is not
too much to commence with, and it should be increased—
say by the addition of .30 (five minims) every other day—
until amelioration of the symptoms takes place, or at least
8. (120 grains) for each dose have been reached. At the
same time free mercurial inunctions every night should not
be neglected."

In their fourth ed., 1879, Drs. Bumstead and Taylor had
said substantially the same thing. The iodide is to be
given up to 24. (360 grains) in twenty-four hours.

From these citations it is seen that, with the exception of
Bartholow (whose extensive clinical experience has given
him an advantage), the leading authorities on therapeutics
and materia medica do not give the necessary information
as to the dosage of the iodides, and that they adhere to the
safe doses, which are without doubt highly dangerous in
a negative way, when administered to a severe case of
cerebral or spinal syphilis. What is truly astonishing,
however, is to find authorities like Nothnagel and Rossbach
teaching *ex-cathedra*, without evidence and argument, that
quantities of 15. ($\scriptstyle \mathfrak{Z}$ ss.), or more, recommended "here and
there," are unnecessary or useless.

The practitioner will also obtain only insufficient informa-

tion from the works on the practice of medicine, with the exception of Bartholow's and Loomis.'   The latter is especially emphatic : " It should be increased to the limit of the patient's endurance."

Nor with the exception of Keyes and Buzzard, are writers on syphilis of the nervous system more advanced.   Indeed, one of the highest authorities, Fournier, denies the utility of massive doses which he " has tried," with a contemptuous reference to the anonymous " certains médecins " who have advocated them.   Yet he is an open advocate of the heroic treatment of nervous syphilis.

Our two American authorities on venereal diseases, Van Buren and Bumstead, with their associates Keyes and Taylor reflect the advanced New York practice correctly and give, as does Prof. Loomis, doses limited only by the appearance of improvement or by intolerance.

I have remarked at the beginning of this paper that the personal recollections of some practitioners and teachers in New York, had greatly aided me in determining the origin of the practice.   Let me quote the following :

Prof. William H. Draper writes me that from 1865 he has realized the utility and absolute necessity of very large doses of KI. in various forms of late syphilis, more especially ulcerating syphilides of the mucous membranes and skin, and in syphilis of the nervous system.   His first knowledge of the practice was derived from the late Professor Van Buren.   Prof. Robt. W. Taylor tells me that he has been cognizant of the practice of giving the large doses ever since 1866–7, when he heard Van Buren and Draper teach it at the bedside.

Prof. E. L. Keyes who was the pupil, associate, and friend of Dr. Van Buren, informs me that he distinctly remembers hearing him teach as far back as 1863, that very large doses of the iodide should be administered in nervous syphilis—

doses much larger than those then sanctioned by authorities, and nearly as large as those I am writing about.

It is true that Van Buren never wrote upon this important subject ; at least Drs. Keyes and E. L. Stimson who have his literary remains know of nothing. The finger of a reliable tradition, however, points back to the distinguished surgeon named, as the originator and disseminator of a mode of dosage which has rendered much good service already.

In this matter, too, a great deal of influential unprinted teaching has been done by Professors W. H. Draper, Keyes, R. W. Taylor and others, which has disseminated the practice far and wide.

The only European writer of note who has, to my knowledge, taken the same stand, is Dr. Thomas Buzzard of London, whose excellent work is dated four years after Dr. Keyes' *brochure*, which he does not quote.

Certain writers (Fournier, Nothnagel, and Rossbach) assert that doses of 15. 20. or 30. of KI. are useless. A negative assertion is much more difficult to maintain in a matter which can only be studied experimentally, than a positive assertion. The positive facts should first be removed or accounted for in some other way, and this has not been done. Simply to state that they have tried the large doses without success is not sufficient to counterbalance the already large accumulation of successful trials.

The American method of administering KI. was developed empirically, on the firm basis of observation in practice. It was found that certain symptoms did not yield with ordinary large doses 8. or 10. (120 to 150 grains) a day ; instead of abandoning the drug it was steadily increased, and it was found that the good result showed itself when the patient was taking 15. or 20., or even more *per diem*.

In another series of cases it was seen that some exceed-

ingly acute or dangerous symptoms, syphilitic epilepsy with coma, acute cranial pain, etc., showed signs of improvement in forty-eight hours when the drug was given in doses of 4. every three or four hours.

Such facts have been often observed by the New York physicians I have named, and by myself.

No one has ever claimed that it is desirable to give large doses in all cases of later syphilitic lesions, and I would consider this an absurd proposition. As stated by all recent authorities, many cases of nervous syphilis rapidly improve and get well under moderate doses of, let us say, less than 8. (120 grains) a day. The vital question, however, is what to do for the exceptional cases; those that exhibit no change from such doses.

Let us now inquire into the indications for the use of large doses. Nowhere, to my knowledge, is this point discussed. It is simply stated, that in severe cases the dose should be rapidly increased to a maximum, — "to the limit of the patient's endurance" (Loomis). Bumstead and Taylor lay down a rule of increase (*vide* p. 123) which, I must say, would be dangerously slow in some cases. And, in certain cases too, the usual tentative small doses to determine an idiosyncratic susceptibility would entail a loss of invaluable time.

I would state the indications as follows :

1. Given a case of chronic or subacute (as regards rapidity of progress) ulcerative syphilide or of nervous syphilis, the rules laid down by Bumstead and Taylor may be followed, and the patient gradually brought to take the full doses.

2. Given a rapidly extending syphilitic ulcer, the larger doses, of from 10. to 15. per diem, should be given at once, and an increase more rapidly made in the ensuing week.

If the ulcer be in the throat much difficulty may be experienced in swallowing the dose. There are two ways out of

this predicament. One is to use the rectum as has been done by Van Buren and Keyes,[1] which may be done successfully for several days if the solution be not too concentrated. Another way which I now propose would be the passage of a nasal stomach tube, and the administration of the solution through it from a funnel. The ordinary stomach tube passed through the mouth would cause much pain, and might produce laceration.

3. Given a case of extremely acute syphilitic cranial pain, whether strictly neuralgic, or from nodes, or from a deeply placed lesion. I believe, that the successful practice, and the safe practice, too, is to begin by doses of 4. (60 grains) twice the first day, three times the second, and so on. This would give on the seventh day 32. (or ℥ i.) of KI.

4. Given a case of cerebral syphilis in coma, or that peculiar stupor so suggestive of syphilis. There may also be convulsions, partial paralysis, and, in my experience, neuro-retinitis. No time should be lost in such a case, and my practice is to give at once 4. (60 grains), every three or four hours, doubling the dose the next day.

5. The question of large doses in syphilitic hemiplegia is more complicated. In the premonitory period, sometimes so distinct, in which we have localized numbness or localized epileptoid spasms (Jacksonian epilepsy) there should be no hesitation; mercurials and potassium iodide should be given at once in full doses, as in cases of stupor. But when there is actual paralysis, especially when suddenly developed, the utility of very large doses is less certain. The former symptoms were of irritation, or of impending ischæmia, while paralysis often means that nerve tissue has been irreparably injured, or actually destroyed, by softening usually. Under the older teachings that most symptoms of cerebral syphilis were caused by gummata, or nodes, hope

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[1] *Op. cit.*, p. 569, foot-note.

might be entertained at almost any stage ; but since Heub-
ner has shown that very often the lesion consists in oblitera-
tion of a large artery (endarteritis) with resulting ischæmia
of a cerebral territory and its death or "softening," we
must modify our prognosis and treatment.   In the moment
cerebral tissue undergoes the process termed "softening,"
it is dead, and no amount of KI. or of any other medicine
can restore it.   The syphilitic lesion, strictly speaking, is
amenable to treatment, but its *residua* are not.

Of course, in nearly all cases, mercury is also to be used with
great freedom if the case be an acute one, but the iodide is
our chief weapon, and with it we should strike hard, re-
peated blows.

One word as to the rate of increase of the dose in chronic
or mild cases where it is not likely that more than a moder-
ate amount shall be required.   Bumstead and Taylor recom-
mend adding five grains (.30) to the dose every other day ;
a rate of increase which I consider as too slow even for
very mild cases, or for little children.   A simple calculation
will show that in this manner it would require nineteen
days for a patient to progress from 1. (fifteen grains) three
times a day to 4. (sixty grains)—a waste of precious time in
some cases.   I usually increase the dose by .30 (five grains)
every day ; in some cases by .60 (ten grains)—that is, in
mild, subacute cases.

Mode of Administration.—There is nothing to be found
on this point in some text-books, and in none are sufficient
details given ; yet, how and when to administer a remedy
are most important elements of success.   As I have else-
where [1] presented my views on this subject quite *in extenso*,
I will now content myself with a few remarks.

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[1] "On the use of a feebly alkaline water as a vehicle for the administration of
the iodide and bromide of potasssium," etc., ARCHIVES OF MEDICINE, vol. vi.,
August, 1881.   "The efficacy of iodide of potassium in non-syphilitic organic
disease of the central nervous system," ARCHIVES OF MEDICINE, vol. ix., June,
1883.   Both papers in "Opera Minora," p. 529 and p. 579.

First, the iodide should be administered largely diluted in simple water, in a feebly alkaline water, or in milk (Keyes). This statement would, I think, be acquiesced in by all experienced practitioners, and is in harmony with the teaching and practice of many authorities. It is interesting to recall that Williams, Wallace, and Elliotson usually gave the iodide simply dissolved in mint water or in camphor mixture.

Second, the time of administration. On this point a singular unanimity prevails: give the drug "after meals," or " on a full stomach," say all the authorities. Yet, not one of them gives a reason for this direction, not even those whose ostensible object is to teach therapeutics. And, indeed, no good physiological reason could be given for this rule, which I strongly suspect is nothing more than blind following after example. In days when the physiology of digestion was practically unknown, when experimental therapeutics was not begun, the eminent physicians who were the first to use the iodide for syphilis (Williams, Clendinning, and Wallace) said give it after meals, and so it has continued. Now, I have strenuously contended against the giving of decomposable medicines, more especially the iodides and bromides, on a full stomach which contains a highly acid semi-fluid mass. It is almost a certainty, theoretically considered, that these salts are more or less split up by the hydrochloric and lactic acids of the stomach, and pure iodine or bromine set free.

The inactive stomach, on the contrary, is, we know, in just the condition to facilitate the simple absorption of saline solutions without chemical change. It is empty, and either neutral or feebly alkaline in reaction. It is capable of rapidly absorbing a large amount of simple water, and probably can do the same thing with an alkaline solution of iodide or bromide. Perhaps, also, a quantity of the solution

passes into the upper part of the small intestines and is there absorbed.

Again, as to the results of experience. I find that by giving iodides in this way iodism is very rare and gastro-intestinal irritation almost unknown. Patients, who had been previously iodized by 1. or 2. per diem, given in the usual way, I found could take from 20. to 30. with impunity. Furthermore, in at least two of my patients, digestion improved while using the larger doses of iodide of potassium diluted with Vichy water, (probably because of thorough washing out of the stomach). I repeat, the iodide of potassium should always be given upon an empty stomach, say about half an hour before meals.

In the next place about the dosage for children. Influenced no doubt by the extraordinary susceptibility of little children to opiates, many practitioners give them altogether too small doses of many remedies. This is notoriously true of the bromides, and I am sure is also true of the iodide of potassium. For threatening conditions of cerebral disease, meningitis, syphilis, etc., if we decide to give KI we should administer it almost in adult doses. In cases of basal meningitis with neuro-retinitis and in some other cases, I have given from 4. (60 grains) to 8. (120 grains) three times a day to patients between four and eight years old, not only with good result as regards the cerebral symptoms, but also without iodism or gastro-intestinal irritation.

Lastly, I wish it clearly understood, that I admit that there are rare individuals in whom the iodide produces toxic effects, even in small doses. But these instances become still rarer where the remedy is given in the way I advocate. And, after all, "iodism" is in no wise dangerous, it is only an inconvenience and a drawback to treatment. Atrophy of testes and mammæ, renal disease, dental decay, are not now recognized as results of the long continued use of the

drug. I have a note from my friend, Professor Bartholow, of Philadelphia, in which he tells me of an instance within his knowledge, in which a patient took 32. (℥ i.) instead of 4. (ℨ i.) at one time, by mistake. " It caused vomiting and acute iodism, but no serious after-effects."

CONCERNING THE CLIMATE OF NEW MEXICO.

BY W. THORNTON PARKER, M.D. (MÜNICH.)

ACT. ASST. SURGEON U. S. ARMY, FORT UNION, NEW MEXICO.

IT appears to one as if health resorts cease to be *health* resorts when they become easily accessible to invalids. Take for instance, the State of Minnesota, so celebrated as a sanitarium in its early days, when comparatively inaccessible, but since it is possible to reach it so easily, its fame has disappeared—the bubble has burst. The great increase of population, the destruction of forest, the damming of streams, the upheaval of the soil, these and other causes have tended to injure its reputation as a health resort.

The genuine health resort must be able to sustain its reputation for many years. In looking back at regions formerly known as health resorts, how few of them are recognized in the true sense of the term, at the present time. Physicians are constantly urging patients to places remote, wild, and unsettled. One prominent Eastern physician in one morning ordered patients to the following places: One to Colorado, one to New Mexico, one to the Adirondacks, one to the South, and another to Davos Platz; actually priding himself upon the diversity of places selected, and the tremendous distances these unfortunates would be obliged to travel. The rashness with which physicians without any personal knowledge, only from hear-

say, send patients great distances is a disgrace to the medical profession, and ought to be stopped. How any man lacking practical information concerning health resorts can unreservedly recommend them and risk what remains of comfort and even life, is a stumbling block for any well-thinking man. Practical personal *knowledge* is as necessary for the climatologist as it is for the therapeutist or the surgeon. It is the well-known custom of general practitioners to refuse to attend cases suffering from severe disease of the eye. Why? Simply because they have not sufficient practical knowledge of the subject to treat the patient successfully, and do not care to hazard their own reputation or the safety of the patient by attempting it. In the case of one consulting the average practitioner for change of climate, little hesitation is shown in giving advice which may prove a total wreck to the prospects of the unfortunate sufferer. The importance of careful selection of climate in the treatment of pulmonary and other diseases cannot be over-estimated. In the *Sanitarian* for May, 1882, I have undertaken to give some practical information concerning health resorts, writing only of places I have frequently visited and carefully investigated. It is the intention of this paper to attempt some information concerning the climate of New Mexico. The sections of the Territory of which I will write are the neighborhoods of Fort Union, Las Vegas, and Santa Fé, in the northern central portions, and Forts Selden and Bayard in the south. Although these places are widely separated, the climate is very much the same throughout the Territory, the mildness of the winter of course increasing as one proceeds south.

" New Mexico is situated in latitude 31 degrees, 21 minutes and 37 degrees north ; longitude, 103 degrees and 109 degrees west. It contains an area of 121,201 square miles. Large spurs, branching out from the Rocky Mountains,

traverse the Territory from north to south, reaching in many instances an elevation of from 10,000 to 12,000 feet. Immense prairies, between these spurs, form the principal features of New Mexican topography." [1]

" The rest of the country " is a broad expanse of rolling meadow land, at an elevation varying from 7,000 to 6,000 feet, sloping off toward the south, and decreasing in elevation down to 3,000 feet above sea level. Away from the general range, mountains, valleys, and plains are more or less abruptly intermingled. In the words of Dr. Bizzell, ' Rapid transition and great diversity of elevation, containing within its border deep valleys, gorges, and cañons, associated with mountains and elevated and more or less arid plains.'

" The soil is, of course, a porous one, as is the case throughout the Rocky Mountain region.

" Water courses are few and far between. Such creeks as there are, all have their fountain-heads in the regions of eternal snow. The water is clear and supposedly chemically pure, being largely melted snow. Temperature of mountain-stream water about 58° F.

" Vegetation is as spare as it is in Northern Colorado, notwithstanding the more southern latitude. The pine growths of the mountains and mountain plateaux are not sufficiently dense to impregnate the air with terebinthine odors, and thus to be considered as a direct antiseptic agent for continuous inhalation."

ELEVATION.

" Every degree of altitude is represented, from 3,000 feet to 8,000 feet and over. The Atchison, Topeka, and Santa Fé Railroad traverses the Territory from north to south. Along its line have grown up the principal towns and settle-

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[1] Circular issued by A., T., & St. Fé R. R.

[2] Dr. Tyndale in *Boston Med. and Surg. Journal*, vol. 108, 1883, p. 265 and p. 313.

ments, representing all the above elevations. Travelling through Kansas on the same road it became clear to my mind that coming from the east through that State, and passing through New Mexico from north to south, an invalid is enabled to make a slow journey, beginning at a comparatively low altitude in Kansas, and travelling westward, to gradually ascend, until an elevation of from 6,000 to 7,000 feet is reached. This may be accomplished without deviating from a straight course westward, and yet to stop at towns of such size as to afford the necessary comforts of life, good food, society, medical attendance, and other things pertaining to civilization. To illustrate this I will give the name of such places, together with their elevations, from east to west on the railroad.

"In Kansas; Topeka, 904 feet; Emporia, 1,161 feet; Newton, 1,433 feet; Larned, 2,015 feet; Kinsley, 2,207 feet; Dodge City, 2,499 feet; Lakin, 3,020 feet.

"In Colorado: Las Animas, 3,959 feet; La Junta, 4,117 feet; Trinidad, 6,034 feet.

"In New Mexico: Las Vegas, 6,452 feet; Santa Fé, 7,013.

"Beginning in the south, at the junction of the Territory of New Mexico with Old Mexico and the State of Texas, the figures run upwards toward the north to Raton, near the Colorado line, as follows:

"El Paso, 3,662 feet; La Mesilla, 3,844 feet; Socorro, 4,665 feet; Silver City, 5,890 feet (not reached by rail); Albuquerque, 5,006 feet; Las Vegas, 6,452 feet; Raton, 7,861 feet."

The first section of New Mexico interesting to the health-seeker is Fort Union, and it would be impossible to describe it better than Dr. Gardner, U. S. Army, who was stationed here, and experienced its trying effects on the newly-arrived. The first days and weeks are in many cases spent in suffering; the altitude is distressing, the constant wind and dust wearying, the tough, disagreeable meat and wretched

food and water simply discouraging, and one is forced to ask the question in despair: What am I here for? After a while these disagreeable impressions wear off, and man, who can accommodate himself to almost any thing in this world, begins to forget his discomforts here, or else to determine to ignore them. Occupation will help to do this, and the summer weather will help to lull one's fears; but when February and March arrive the situation is indeed a serious one, and every protection and possible comfort is needed to carry the invalid or delicate person through safely until June. The experience of Dr. Gardner was much like that which I went through with after my arrival at Fort Union, and for some weeks afterward. It has been the experience of others of my acquaintance, and it must be the lot of many to suffer in the same way. The climate of Fort Union is supposed to be changing, and undoubtedly it is, as well as other sections of our country. The town of Watrouse, New Mex., eight miles south of Fort Union, would furnish very simple accommodations for summer residents, but could not be recommended at all in winter. The inhabitants are mostly Mexicans, and life would be very dull and monotonous. At Fort Union itself no accommodations could be furnished, there being neither hotel, or residents who are not connected with the military post.

"Fort Union [1] is situated in a narrow valley on the eastern slope of the Rocky Mountains, and is about 6,835 feet above the level of the sea. The soil around it is composed of fine sand, with a slight admixture of yellowish clay, and is underlaid by trap-rock and irregular beds of dark lava, which have apparently overflowed from a volcano now extinct, about thirty miles to the northward of the Post.

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[1] Dr. W. H. Gardner, U. S. Army, cited in "Circular No. 8," S. G. O., 1875, p. 303.

" Wind from some quarter is almost constant, and the soil being light and sandy, is blown about in clouds of blinding, suffocating dust, that irritates the air passages, and is the prevalent cause of catarrhs, pharyngitis, and bronchitis.

" The diurnal variation in temperature is very great, the thermometer frequently showing at 6 A. M. but 60°, and at 2 P. M. 97° ; even in midsummer nights one or more blankets are always comfortable to sleep under.

" Now, from the foregoing causes, viz.: the high elevation, the constant winds, the suffocating dust storms, and the great diurnal variation in temperature, I do not believe this Post can be favorable for any kind of lung disease, and though my medical experience here is limited, I believe it will point to the same conclusion.

" The question of increased altitude as a source of disease has been one of great interest to me personally, and as I suffered as much from it myself as any other case I have seen, I will give you the history of my own case. Shortly after arriving at the Post I was attacked with a fulness of the head, ringing in the ears, mental hebitude, and confusion of ideas, dizziness, and headache. Thinking these symptoms might be caused by constipation, dyspepsia, or torpidity of the liver, I took a mercurial purgative, and followed it up with a dose of Rochelle salts, which relieved the fulness of oppression for a day or two, but it at once returned, the dizziness and confusion of ideas increased, and a feeling of numbness and tingling commenced in the fingers of the left hand and gradually spread until it involved the whole left side, even the muscles of the tongue being involved in the paralysis so that I could not articulate. There was also oppression of breathing, throbbing of the carotids, and slight dilation of the pupils. The only medicine handy at the time of the first attack was a bottle of chloroform ; and thinking the symptoms might be due to

spasm of the cerebral or pulmonary veins, I poured a dram or two on my handkerchief and inhaled it, when the disagreeable symptoms promptly subsided. The next day, on my visit to Dr. Moffat, of our corps, (who you will recollect was lying here disabled with a broken leg) I told him of my troubles, and he thought they were due to malarial poisoning, and advised me to commence a course of quinia and arsenic, which I at once did, taking twelve grains of quinia and $\frac{1}{10}$ of a grain of arsenic each day. But in the course of five or six days, while under the full influence of these medicines, I had another attack, in all respects similar to the first, coming on after a hearty dinner, which was relieved by a prompt emetic. Shortly after this second attack I was sent for to attend a case of midwifery at Mora (a little town in the mountains, fifteen miles northwest of the Post and about 400 feet higher in altitude), and while there alone I had another attack more severe and prolonged than the other two, and upon this occasion I certainly thought there would be another vacancy in the Medical Corps to fill, for I took emetics, bromide of potassium, and chloroform *ad nauseam* without the least effect.

"The symptoms went off before morning, but when I got back to the post I brought the Darwinian theory to bear on the case. If the environment of an animal be suddenly changed and the animal does not change its habits to suit its environment it will be speedily eliminated. The only radical change in environment I could detect here was decreased atmospheric pressure from increased altitude and consequently deficient oxygenation of the blood. The indication, therefore, was either to supply the deficiency of oxygen to the blood or to reduce the volume of blood to the decreased amount of oxygen. The latter alternative seemed the easiest and the most certain. I therefore decreased the amount of my nitrogenous food, and made up

the quantity by laxative vegetables and fruits, and have been in good health ever since. I have seen two cases since, in every respect similar to mine, and they have promptly succumbed to the treatment indicated : that is, decreasing the amount of blood to the decreased amount of oxygen, by cathartics and decreased animal food.

<p style="text-align: center">*   *   *   *   *   *   *</p>

"One question I should like to add before closing : Are adobe quarters productive of rheumatism ? I believe they are a fruitful source not only of rheumatism, but sciatica, and other forms of neuralgia."

Such is the description given by Dr. Gardner, and his experiences will be repeated very often, I have no doubt.

The following table from the Post Hospital records may prove interesting, showing the even ranges of temperature for the years 1880, 1881, 1882, 1883, and 1884.

FORT UNION, NEW MEXICO.—1880.

Mean temperature for			January	39.37	Max.	68	Min.	5
"	"	"	February	no observations taken (Steward absent).				
"	"	"	March	39.83	Max.	68	Min.	10
"	"	"	April	51.49	"	74	"	14
"	"	"	May	60.59	"	84	"	29
"	"	"	June	69.97	"	91	"	32
"	"	"	July	67.76	"	92	"	48
"	"	"	August	65.03	"	84	"	41
"	"	"	September	59.76	"	80	"	24
"	"	"	October	47.84	"	78	"	13
"	"	"	November	29.72	"	69	"	15
"	"	"	December	33.49	"	68	"	11

FORT UNION, NEW MEXICO.—1881.

Mean temperature for			January	26.25	Max.	62	Min.	25
"	"	"	February	34.68	"	67	"	21
"	"	"	March	37.77	"	69	"	2
"	"	"	April	52.86	"	75	"	5
"	"	"	May	60.33	"	76	"	28
"	"	"	June	73.77	"	94	"	45
"	"	"	July	71.24	"	96	"	45
"	"	"	August	66.80	"	84	"	40
"	"	"	September	59.85	"	84	"	25
"	"	"	October	50.47	"	79	"	18
"	"	"	November	33.27	"	58	"	5
"	"	"	December	37.16	"	70	"	0

FORT UNION, NEW MEXICO.—1882.

Mean temperature for			January	29.86	Max.	66	Min.	11
"	"	"	February	36.44	"	62	"	0
"	"	"	March	41.71	"	74	"	12
"	"	"	April	47.98	"	80	"	5
"	"	"	May	52.61	"	79	"	23
"	"	"	June	65.38	"	91	"	32
"	"	"	July	68.58	"	92	"	40
"	"	"	August	65.79	"	89	"	36
"	"	"	September	60.84	"	83	"	21
"	"	"	October	51.38	"	76	"	14
"	"	"	November	37.40	"	75	"	4
"	"	"	December	33.01	"	66	"	10

FORT UNION, NEW MEXICO.—1883.

Mean temperature for			January	29	Max.	61	Min.	30
"	"	"	February	32	"	62	"	7
"	"	"	March	43	"	71	"	10
"	"	"	April	47	"	75	"	9
"	"	"	May	58	"	85	"	21
"	"	"	June	68	"	95	"	30
"	"	"	July	69	"	90	"	44
"	"	"	August	66	"	85	"	42
"	"	"	September	60	"	86	"	27
"	"	"	October	48	"	75	"	15
"	"	"	November	41	"	71	"	5
"	"	"	December	34	"	69	"	2

FORT UNION, NEW MEXICO.—1884.

Mean temperature for			January	31.56	Max.	65	Min.	13
"	"	"	February	34.75	"	67	"	21
"	"	"	March	39.30	"	63	"	9
"	"	"	April	43.61	"	72	"	15
"	"	"	May		"		"	
"	"	"	June		"		"	
"	"	"	July		"		"	
"	"	"	August		"		"	
"	"	"	September		"		"	
"	"	"	October		"		"	
"	"	"	November		"		"	
"	"	"	December		"		"	

The total rain and snow fall for Fort Union for the years 1880, 1881, 1882, 1883, were as follow :—

1880, . . 19 inches, 1882, . . 9.41 inches.

1881, . . 22 " 1883, . . 14.50 "

Concerning the dryness of New Mexico the average hu-

midity is about 38%, while in the following States and localities it is as follows : [1]

" New England States, 75%, Middle Atlantic States, 74%, South Atlantic States, 79%, Gulf States, 82%, Lower Lake region, 70%, Upper Lake region, 70%, Ohio Valley, Tennessee, and the Northwest, 73%, Lower Mississippi Valley, 58%, Denver, Colorado, 42%."

The "rainy season" commences in June and lasts through the summer and fall. By rainy season we refer to occasional showers perhaps daily for a week or so. Now and then a terrific hail storm will rage for a short time, followed by rainy and cool weather. May 31st, a severe hail storm visited this Post smashing hundreds of panes of glass and doing considerable damage otherwise. The hail stones were very large, some quite the size of eggs. The houses were flooded with water, and it was very cold for a week or two, fires being necessary in all the rooms. From the middle of June the sun shines with intense force, making out of doors occupation almost impossible, but, strange to say, cases of sunstroke almost never occur. The constant wind in New Mexico is a great protection to those who are exposed to the strong rays of the summer heat. About three or four o'clock in the afternoon clouds will appear, followed by wind or rain, and the evening and nights are cold. These sudden changes, together with the action of the water, excite a loose condition of the bowels, and diarrhœa, and even dysentery are of frequent occurrence. The high altitude affects most people very unpleasantly, at least for a time, and many suffer until they leave the country. " Nervousness," neuralgias, and all heart-trouble seem to increase. A strong desire to sleep, but awakening without much sensation of refreshment, if any. Weariness, languor, confusion of ideas, inability for exertion, or study, depres-

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[1] Circular A., T., & St. Fé R. R., concerning New Mexico.

sion of spirits, almost to despair, are common ailments due to this climate and elevation. Fast walking and running are out of the question, and troops are not allowed to be drilled in the "double quick." Loss of appetite, indigestion, dyspepsia, and biliousnes show that the intestinal tract is affected by the change. Colds, catarrh, etc., are very prevalent ; and pneumonia is rapidly and generally fatal. The houses are mostly built of "adobe," sun-burnt brick, and are cold and chilly, except in the hottest weather. Rheumatism on this account is *very* prevalent and severe. Glandular inflammations are common. Simple adenitis of the groin, without apparent cause, is very common.

If I may be pardoned in this paper for mentioning servants, I would say that it is almost impossible to get any, and ladies coming from the East and attempting housekeeping without servants soon lose health and strength, if they are not permanently *aged* or completely broken down. From amongst the lazy, shiftless population of natives it is quite impossible to obtain help, and ordinary "niggers," who would not be tolerated in well-regulated eastern homes, receive from twenty-five to thirty dollars a month and are hard to find at that.

All living expenses are very high, and life at best is perplexing, discouraging, joyless, and tends to despair. There is nothing to cheer or to interest one. Even the bravest, who shot off with many plans and energetic promises, soon fall off into the dreary humdrum struggle for an existence. The desperate character of many of the inhabitants forbids a moderate investment in either cattle, mines, or farms, and the country is so covered with Spanish land grants that it is hard to obtain any just title. The whole region has, in my opinion, been over-estimated in every particular. It cannot be claimed that I have any interest in making these statements, which seem any thing but complimentary. I am not

a discouraged adventurer here, neither have I any reason to speak ill of the land in an unkind spirit. I endeavor in this paper to do my duty in explaining, as fully as I am able, to the many in the East who may be ordered here and tempted to come for health and life, the state of affairs they must expect to find. Leaving comfortable homes and loved friends to come out to this wild, semi-civilized, inhospitable region, to spend all their money and hope, and at last to go back discouraged and weakened, or to be returned *dead*. Many undoubtedly come here too late, *some* come and are benefited, but, alas! how few, and at sacrifices which make life itself an expensive luxury. For the wife or mother struggling here with such patients to take care of, the blame for ordering the family out West to New Mexico, if it is to be placed on any one's shoulders, must be, or ought to be, a heavy load to carry. Some, discouraged and rapidly sinking, hasten home with wife and children, and *die on the cars*. Consider for one moment the anguish of death in such a position, and the difficulties of widow and children, cut off from the consolations and assistance of friends, perhaps without money, and at the mercy often of unprincipled scoundrels. It may happen some true-hearted man is at hand to help honorably, but, alas, it is not always, if even occasionally, the case. The death of patients amongst strangers is always hard, even at our health resorts in older lands—imagine for a moment the sickening experience in the wilds!

There is, however, one feature of New Mexican life which is to be remembered, and that is the glorious sunshine. Even in the midst of depressing, demoralizing dust storms, the sun shines out to encourage and cheer and show us that the God of nature still reigns. Then, too, the snow-capped peaks of the " Rockies," rising to a grand height, add beauty to the scene, and form a striking frame-work to the

picture of this wild land. The early mornings are beautiful, and the refreshing evenings are thoroughly enjoyed.

If it were not for the blinding dust storms, which suffocate and make facing them while walking or riding well-nigh impossible, there would be much to admire ; but the dust destroys all hope of falling in love with the country, and when this, the greatest evil, is added to all the others I have mentioned, life in New Mexico has verily few attractions. The poverty-stricken soil is so seldom refreshed with rain that the cultivation of vegetables is almost impossible, and those to be obtained from the Mexicans are miserable and very expensive. The meat is generally poor and tasteless. The winters draw so heavily upon the sustaining powers of the cattle, that during a greater portion of the year they are poor and tough and not fit to eat, although they are supplied as food, and no other meat is obtainable except a little mutton, as miserable as the beef. Poultry is very hard to find, and of an inferior quality.

Probably the pleasantest spot in the whole Territory, and the healthiest, unless we except Santa Fé, is the Las Vegas Hot Springs region. The Springs are beautifully situated about seven miles from the town of Las Vegas (the meadows) at the entrance to the Gallenas cañon. They are set in the midst of the foothills so cosily that violent wind and dust storms lose most if not all their tormenting power. The altitude of the Springs is six thousand seven hundred feet above the level of the sea.

The Springs are easily reached by a branch of the Atchison, Topeka & Santa Fé R. R., and the ride from Las Vegas is indeed a pleasant one. The railroad company, with considerable enterprise, have spent large sums of money in making improvements, and few places west of the Mississippi can boast so many attractions. Dr. Gordon, lately of the United States Army, is located permanently at the

Springs, and patients sent to his care will receive the best professional attention possible. There are from thirty to forty of these celebrated springs, situated at the base of a foot-hill sloping down into the Gallenas river.

"In their thermal properties they are divided into two classes: One including springs of a temperature from one hundred and twenty degrees F. to one hundred and forty degrees F. ; the other springs varying from seventy-five degrees to one hundred degrees F. There are thirty of the former and ten of the latter.

"Twenty-five of the principal springs have been excavated, so as to form reservoirs, and have been walled and covered with the native red sandstone. Many of the springs are not at present required for the bath-house supply. A single spring, No. 6, furnishes, alone, thirty thousand gallons of water daily, at a temperature of one hundred and forty degrees F.

"The warm springs flow from these basins or reservoirs direct into the bath-houses, while the cooler ones run into large tanks upon the hillside, and are thence conducted into the bath-houses to furnish cold water as required.

"The skin after taking a bath in these waters has a soft velvety feeling and a freshness of aroma savoring of the cosmetic." [1]

These baths furnished at the Las Vegas Hot Springs are supposed to be beneficial especially in rheumatic, scrofulous, and other affections, and are useful in many forms of skin diseases. There are two bath-houses, one for the ordinary hot, cold, and vapor baths, well arranged and very comfortable, and the other a rudimentary affair for mud-bathing. The main bath-house is built of stone, and is really a handsome structure, two stories high and two hundred feet long by forty-two feet wide.

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[1] Circular, A., T., & Santa Fé R. R.

The bath-rooms are in the lower story, the upper being occupied by the offices of the physicians, drug-store, post-office, bath-office, etc. The bath attendants are at present excellent, and have been carefully selected. It is claimed that the entire capacity of both bath-houses is 1,000 baths per day, but of course the number of bathers do not require so much attendance as yet.[1]

Separate apartments with complete bathing apparatus are furnished those suffering with contagious diseases.

The baths are given at a temperature of from 90° to 100°.

The mud baths given at these springs are similar to the celebrated peat baths of Franzensbad, Bohemia. " The percolation of chemical water for centuries through the earth surrounding these springs has produced this peat, or mud. Viewed under the microscope it appears gelatinous, its earthly properties having undergone a change."

The average temperature of the mud bath is about 108°.

One hundred and six degrees is probably the best, and is very agreeable.

The average duration of the bath is one hour, but the time may vary from thirty minutes to three hours. One bath is usually taken each day. Upon leaving the tub the patient is washed off thoroughly under a graduated douche, and after being " hosed off," is then rubbed down clean and dry, and placed on a comfortable couch in the " resting room " for half an hour. The bath is supposed to act like

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[1] The baths, including attendance, towels, etc., cost as follows :

Shampoo baths	*Each*	$1 00
Electric "	"	1 00
Medicated " .	"	1 00
Vapor "	"	75
Vapor and pack baths	"	1 00
Tub baths .	"	50
" and pack baths	"	75
Mud baths, singly	"	3 00
" " three for $5 00 ; five for $8 00 ; seven for $10 00, and ten for		12 50
Special treatment, Massage		7 00
Massage at time of taking bath		50

  Bathing hours, 6 A. M. to 6 P. M.
  On Saturdays, bathing hours 6 A. M. to 10 P. M.

a huge poultice, extracting by free diaphoretics, or sweating, diseases that have baffled skilful physicians both at home and abroad. The pack and massage are often ordered to follow the mud baths as a re-inforcer.

In preparing the mud baths, the mud is first freed from all foreign substances, such as sticks, stones, etc. Each tub is then half filled with mud, and mixed up with the warm spring water, to the consistency of paste. The bath is warmed up by steam at bathing time to the required de-gree of heat ordered by the physician in charge of the patient. Every five days *fresh* mud is ordered, and the old mud cleared out. It is amusing in passing through the bath-house to read the labels. Mr. S.'s mud: Rev. Mr. D.'s mud; Mrs. A.'s mud, and so on. The boxes look like coffins, and the bather is held down in the tub by a board placed across the chest and firmly fastened down; otherwise he will rise on top of the mud. It is said that at first ladies shrink from entering the repulsive stuff, and can hardly be forced to do so; but having once enjoyed the bath, it is hard to keep them away from it !

At the Hot Springs there are several local attractions in connection with the hotels—museum of antiquities, aviary, zoölogical collection, etc., besides a large green-house, well filled with floral and variegated plants. The hotels at the Springs are in postal, telephonic, and telegraphic connection with Las Vegas and the outside world. The hotel rates are from $3 to $4 per day—$17 50 to $24 a week. There are several cottages upon the grounds where private board at reasonable prices can be obtained.

The next most desirable residence for the temporary visitor to New Mexico if not altogether the best place in many respects, is the old city of Santa Fé. It is at first a forbidding place but one learns to like it, and although the native inhabitants are mostly dirty uninteresting people,

really delightful society is to be found in Santa Fé the year round. Living expenses are high in Santa Fé as elsewhere in the West, and servants few and hard to find—but compared with all the other towns in New Mexico, Santa Fé is certainly the most comfortable. The same climatic advantages and drawbacks exist here as at Las Vegas and Fort Union and other New Mexican towns. I attach to this paper another report from the " Army Records " showing the characteristics of the climate and some of its disadvantages :

" The city of Santa Fé[1] is pleasantly situated on an extensive plateau on the western slope of the Rocky Mountains at an elevation of 6,850 feet above the level of the sea, and in latitude 35° 41′ north, longitude 28° 59′ west. To the north and east rise the foot-hills and peaks of the Rocky Mountain range ; on the south the plateau is gradually lost in spurs of mountains shooting out of the main range, and on the west it terminates somewhat abruptly in the valley of the Rio Grande. * * * Fort Union is distant about 100 miles to the eastward. * * * To the south runs the main road to Albuquerque and Southern New Mexico, and less important roads to the neighboring towns. The Rio Grande runs in a southwesterly direction from Santa Fé about eighteen or twenty miles distant at the nearest point. A small mountain stream—a tributary of the Rio Grande—called the Rio de Santa Fé nearly bisects the town. The soil of Santa Fé and vicinity is dry, light, and sandy and yet very fruitful. The country for miles about Santa Fé is destitute of trees. The large growth is said to have been cut away at an early date in the history of the place for fuel and for better security against hostile Indians, and a subsequent growth of large trees has

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[1] Information concerning Santa Fé, New Mexico, furnished in '' Circular No. 8,'' Surgeon-General's Office, by Surgeons Alexander and Huntington, United States Army.

not appeared, though stunted cedars and pines are very
common. This want of vegetation detracts much from the
natural beauties of the town and vicinity. On the hills
toward the mountains are found large pines and cedars.
The piñon, a species of pine, furnishes the almost sole sup-
ply of fire-wood. It is brought for miles on the backs
of donkeys, and sold by the load in the plaza at from twenty-
five cents to one dollar, according to the season of the year
or severity of the weather. The natural drainage of Santa
Fé is excellent, and is materially assisted by an extensive
system of *acequias* or canals around the town. Still, little
attention is paid to the subject and many of the narrow
streets and lanes of the city are excessively filthy. The
river water is very extensively used for drinking purposes
and is excellent. Good water, but a little impregnated
with lime, may be obtained by wells at a depth of from ten
to forty feet.

"The population of Santa Fé is about 6,000, of which
the larger portion is Mexican and Indian, or an admix-
ture of the two. The American element is rapidly increas-
ing and already has the chief influence in matters of trade
and politics.

"The place is irregularly built of adobe, and when seen
from the approaches of the town has an exceedingly un-
inviting appearance. The houses are generally built on the
Spanish plan, a quadrangle with an interior court yard, the
entrance being through a gateway generally kept closed.
The older portions of the town are built upon narrow lanes
and passage-ways rather than upon streets. The better por-
tion is the more recent, and is inhabited by the American
residents. The plaza holds a conspicuous place as a business
centre and about it are the civil and military offices."

To the excellent description from which I have just
quoted is appended a communication from Dr. Smith,

of the United States Army concerning the climate of Santa
Fé for invalids.   His remarks are very valuable and should
be given considerable weight in selecting this climate for
pulmonary patients.

" From an experience of fourteen months and upon
rational grounds, I cannot coincide in the popular belief
that Santa Fé and the contiguous localities, of equal or
superior altitude, are well adapted as a residence for persons
suffering from pulmonary tuberculosis, heart disease, or any
cause producing obstruction to free and ample respiration.
The universal testimony is, so far as I can ascertain, that a
stranger to the rarefied atmosphere, however sound his pul-
monary and circulatory organs may be, is almost invariably
affected by a great oppression in respiration upon his
advent into this elevated country, accompanied naturally
by an unwonted lassitude and indisposition for exertion.

" There have been in the case of two or three of my ac-
quaintances ugly symptoms of a partial paralysis of the or-
gans of locomotion and speech.   A continued residence,
however, is said to overcome these unpleasant effects in
persons of *sound* and *robust* health, and from the number of
Americans and Germans residing in the higher regions of
New Mexico, who transact their business at no small ex-
penditure of physical exertion, I believe this to be the case,
and that *in time* an accommodation obtains between the
lungs and the somewhat diminished quantity of oxygen.

" As regards the *invalid*, whose breathing apparatus is
crippled by tubercular deposit, by chronic pneumonia, or
whose blood, whatever may be the cause, requires full aera-
tion, I deem it worse than useless for him to endeavor to re-
gain health or even comfort in such localities.   I regard my
lungs (and my chest measurement is forty-four inches) as
perfectly sound, and yet, after reporting for duty in Santa
Fé, I could not, as a general rule, breathe comfortably, al-

though at times, when a damp atmosphere prevailed, I
could not notice any impediment to respiration. The past
summer (1874) was exceptionally warm and I was at inter-
vals asthmatic to a terrible degree, crushed actually by a
feeling of impending dissolution. The common advice to
me was 'Wear it out; you will be all right next year.' No
sooner, however, had I started East than my troubles, as I
descended in altitude, lessened proportionably."

The places south of Santa Fé in my opinion become less
and less desirable, although one seeking a very mild winter
climate might try Silver City if suitable accommodations
could be found. For a single man a certain kind of living
might be put up with for a time, but for the invalid, or for
an Eastern family used to comforts and even luxuries of
life, a residence further south than Santa Fé or Albuquerque
is, in my opinion, undesirable. The Rio Grande valley has
some advantages in its mild winter and absence of snow.
The summers are said to be cool and pleasant, but when I
rode through on horseback in 1867 I found the climate hot
enough. The best opinion concerning the climate is to be
found in the reports of the medical officers to the Surgeon-
General's office and those on Fort Selden and Fort Bayard
now presented. The climate was the same then as now and
the officers who made the reports did so only after careful
investigation.

"Circular No. 8, Surgeon-General's Office, Fort Selden, New
Mexico." Report of Dr. Jessop, U. S. Army :

"Fort Selden is situated on a sandy basin one and one half miles
from the Rio Grande, in southern New Mexico. Latitude 32°25′
north ; longitude 30° west ; altitude 4,250 feet. Fort Cummings,
fifty-five miles west—Fort Bliss, Texas, sixty-seven miles south
(nearest town La Mesilla).

"Lung troubles are comparatively rare at Fort Selden, as are
all diseases of the respiratory organs, excepting catarrh, which I
prefer to consider separately from bronchitis, as it mostly affects
the mucous membranes of the nares, tonsils, and larynx, and, I

think, seldom extends even to the trachea. It seems to be pro-
duced by the almost constant drifting of the irritating dust pecul-
iar to this region, and few new-comers who are much exposed in
the open air escape it. It gradually wears off as they become ac-
climated. Women, from their in-doors habits, are usually freer
from it. The native New Mexicans are not at all affected by it.
Many of them, however, suffer from a form of bronchitis, induced
it is thought, by their peculiar fashion of smoking the cigarita,
i. e., by inhaling the smoke into their bronchial tubes and exhaling
through their nostrils. The climate of this part of the valley of
the Rio Grande will improve and probably tend to the cure of
many patients afflicted with commencing phthisis, but only by a
residence here, not a sojourn of a few months. I think I am
within the mark in stating that it will take from eighteen months
to two years to acclimate them. To those in advanced stages of
consumption, no such benefit can accrue. Added to the annoy-
ance of the dust-storms, are the distance from home and the im-
possibility of obtaining many of the comforts, and especially the
varieties in food, which the sick always crave. The prognosis is
extremely serious if diarrhœa be a complication, and here I may
observe that all cases of chronic diarrhœa appear to do badly at
this Post, and that, with my present convictions, I would not suf-
fer, if it could be avoided, a patient laboring under this disease to
remain at Fort Selden or any point where the Rio Grande consti-
tuted the water supply. The enervating nature of the climate has
doubtless much to do with the ill-success attending the treatment
of such patients. As regards chronic bronchitis, I can only speak
for New Mexico, and, for that disease, I consider the climate of
this region as the best in the Territory."

Near Ft. Bayard is a bright little town called Silver City,
which I have already briefly referred to. Grant county is
considered one of the best counties in the Territory, and the
business enterprise of Silver City is very much in its favor.
The town is pretty well supplied with stores, and living is
not quite so tiresome here as at many other places in the
Territory. Ft. Bayard is situated in the extreme south-
west corner of the Territory, in latitude 30° 40′ north, longi-
tude 31° 25′ west, at an altitude of 6,022 feet.

The military Post is one of the most delightful in the

West, and a great favorite with the Army. Diseases of the heart do badly here, and the climate, excepting that it is milder in winter, is much like the northern sections already described. It is a long way from home for the invalid, and summer "*wash-outs*" on the railroad make the States seem very far away indeed sometimes.

"Circular No 8, War Dept., Surgeon-General's Office, 1875. Fort Bayard, New Mexico." Report of Dr. Wilson, U. S. A.

" In bronchitis, either acute or chronic, this climate is unfavorable either for cure or relief. The air is too rarefied and too stimulating, and acts almost as an irritant to the bronchial mucous membrane. I have also observed in even slight cases of catarrh attended with cough, that they are very intractable. I have seen several cases of phthisis, and have one at the present time under my charge, but I have not seen any beneficial results produced by this climate. They have all gone on from bad to worse, and finally died. I believe that it is only in the very early stages of tubercular disease that this or any other climate can exert a beneficial influence. * * * There are, so to speak, two classes of cases, one of which is characterized or accompanied by a dry hacking cough, but with little expectoration and a tendency to hæmoptysis. In the other, there is copious secretion from the bronchial mucous membrane. This latter class would be benefited by a mild, dry, climate not subject to sudden changes and of a lower altitude than this, say 2,000, or 3,000 or 4,000 feet. The former class would lead a life of torture here, and this climate or one similar to it would only add to the mischief already done. They would be benefited by a mild, moist climate in close proximity to the sea. Phthisis is almost unknown among the Mexican population here, notwithstanding their filthy habits, probably on account of their living nearly all the time out of doors and being natives of the soil and accustomed to this climate. I know that horses brought here from the States, and cattle introduced here go down in condition for the first year until they are acclimated, and I believe that the human race require also a certain time for acclimation."

In summing up the *advantages* of the New Mexican climate we find first a considerable degree of *elevation*. Dryness is

very decidedly present. Vivenot[1] classifies moistures as follows :

Dry, below and up to 55%.

Moderately dry, 56 to 70%.

"   moist, or moist, 71 to 85%.

Excessively moist, 86 to 100%.

Referring to the tables taken from A., T., and St. Fé R. R. circular we see that New Mexico can boast of a *very dry climate*. The percentage of clear sunshiny days is very great, and the amount of inclement, disagreeable weather is proportionately small. One can get out of doors for a considerable part of the winter. The *disadvantages*, and they are many, have been mentioned. The principle one is the *great elevation*. Here we have the advantages and the disadvantages of *elevation*, and it is hard to say which are greatest. It is worth while to mention that when " the country in the northwest, middle, and eastern States, is icebound and frozen, the residents of New Mexico are basking in genial sunshine."

Undoubtedly this paper may be read by English people contemplating a visit to the Southwest. To those used to the climate of England, only excepting the beautiful Isle of Wight and the grand south coast, New Mexico will prove an interesting, and I believe, in many respects, a profitable change ; but—and it is a large *but*,—we have in the United States many desirable climates: the Adirondacks, the Mountains of Tennessee, the regions of Moosehead Lake, Montana, and last, but not least, the glorious climate of Colorado. The warm climates may be good, and the mild winters desirable, but the evidence lately seems to show that the cold clear climate of Colorado is the best for cure, and the best in the end, and the happiest home for the invalid obtainable. In coming to this climate and to this

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[1] Quoted by Dr. Tyndale in *Boston Med. and Surg. Journal, l. c.*

country, and leaving behind the comforts and luxuries of the last, and accepting Western hospitality is a great change indeed.

To the average Englishman, accustomed to his comfortable home and well-regulated table, be he in robust health or an invalid, the American hotel, and especially in western towns, is simply discouraging. To the West people flock for money-making, and personal comforts are of secondary consideration. The invalid must take his chances with the rest. Rents are high and separate houses are hard to find—one must choose between the hotel and the boarding-house. The first-class hotels are, of course, very fair, but the charges are exorbitant, considering what one gets. The boarding-houses are simply unendurable, both as regards food and accommodations generally. Society is, of course, very much mixed, although there are always some agreeable people at all places.

For one, however, willing to endure hardship and take life just as he finds it, and with plenty of means at his disposal, and who can plan and carry out the journey comfortably, it may be well to seek the American health resorts of Colorado or New Mexico. When we consider the bright sunshine, so generally present, and the invigorating, healing atmosphere, which is especially obtainable in Colorado, and the opportunities for out-of-door exercise, and the possibility of regaining health, the journey is worth all the trouble and expense and suffering. It is important to know where to start for, and the proper route to take, besides the time of year and the expense. It is best in going to Colorado to make Denver the first objective, and for New Mexico, Santa Fé or Las Vegas Hot Springs.

The hotels are constantly improving, and better attention is paid to the comfort of guests. New houses are constantly being built, and conveniences, which are so necessary for

the invalid, are also increasing each year, and better protection against the winds and dust are constantly being afforded. A well-filled purse is, however, of the first importance, and to creep along with insufficient means only brings unhappiness and disaster upon those attempting it. Certainly it is quite unnecessary to banish any one to the Davos Platz, which does not begin to afford the advantages to be found in Colorado or New Mexico, and is nearly if not quite as expensive for the Englishman or American as a trip to the far West.

For the invalid going either to Colorado or New Mexico, one word of caution is necessary, and that is : lessen the dangers of hemorrhages by approaching the elevated regions *gradually.* Many lives are undoubtedly sacrificed by this hasty *rush* from New York to Denver or Santa Fé. The sleeping cars are luxurious and the dining cars excellent, but a rest for a few days in Chicago or Kansas City, and another rest half-way before reaching Denver or Las Vegas is most desirable, and will pay in the end without doubt.

The best season to go West is in the spring or fall, to be somewhat acclimated and settled before winter, and to avoid for the invalid the journey in hot, dusty cars in summer is not to be lost sight of. A well-filled lunch-basket, and a flask of good wine and another of brandy, besides some preparations of easily-taken beef-essence, like the London Manufac. Co.'s preparation, or Valentine's meat-juice, is very necessary for the safety of the invalid, and should not be overlooked. A preparation of coca wine, made by Theodore Metcalf & Co., of Boston, is the best single preparation for travellers that I know of.

This preparation of wine of coca of Metcalf's is desirable for the invalid after reaching either Colorado or New Mexico. Coffee and tea are too stimulating, and exert an injurious influence on the nervous system in these high alti-

tudes. Coca is desirable as a sedative to the nervous system, and at the same time a delicious, invigorating tonic. Constipation is very apt to trouble the traveller not only on the journey, but after his arrival in the new country, and some easily taken cathartic, like Brewer's tartrate of soda, in effervescing granules, or the new and excellent cathartic also manufactured by Metcalf & Co., of Boston— Rhamnus Frangula—will be found very valuable, and will obviate those distressing headaches and general malaise which a long journey is apt to induce. The traveller needs few medicines besides these mentioned. He is seeking for the climate cure, and if he obtains that to his satisfaction, the battle is won.

The hunting and fishing in New Mexico is not to be boasted about. Game is not plenty, and hunting can only be found away from the settlements and at considerable expense and trouble. There is some, to be sure, and the devoted huntsman will find it.

There are many interesting excursions to be made, and the ancient Pueblos offer considerable that is interesting in their history and customs.

As to business enterprises, I should hesitate a long time before advising any one to assume the risk either in " cattle and sheep ranches, mines, or manufactories." For professional men and especially doctors the prospects are gloomy in the extreme, and visitors are not at present numerous enough to offer any inducement to hope for practice from them ; the native population would, to say the least, be very undesirable patrons. The schools are of course very inferior, and the territory of New Mexico is not a desirable place to bring up a child in the way he should go. To make the experiment of New Mexico for health is a lottery indeed, and while many may lose their all, *life and health may be found !*

The Atchison, Topeka, and Santa Fé Railroad from Kansas City is *the* route to New Mexico. It is a well-managed, comfortable, and even luxurious road, and the welfare of the travelling public is constantly attended to. The eating-rooms at the stations all along the road are excellent, and directly under the railroad management.[1]

I have tried to explain the situation to the best of my ability. The physician must choose for his patient, and the patient must get the best information obtainable. To those going to New Mexico either for health or pleasure, there is much to be seen and learned of which this short paper cannnot treat. To all a pleasant, profitable journey is most sincerely wished.

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[1] The following is a schedule of rates to Las Vegas Hot Springs :

	1st class.	2d class.	Round trip, good for ninety days.
Chicago .	$46 15	$35 65	$57 80
Kansas City .	31 35	27 75	37 80
Atchison, Kan.	31 35	27 75	37 80
El Paso, Tex., to Hot Springs			22 80

ILLUSTRATIONS OF THE ANOMALOUS COURSE OF POSTERIOR SPINAL SCLEROSIS.

By E. C. SEGUIN, M.D.

THE typical or normal course of the disease variously known as posterior spinal sclerosis, progressive loco-motor ataxia, or more briefly, tabes dorsalis, has become generally known to the profession by the dissemination of recent text-books of diseases of the nervous system and of monographs upon the disease in question. The writings of Charcot and Erb particularly have been of service in thus rendering familiar the numerous symptoms of tabes and their grouping into three stages, viz.: the pre-ataxic or neu-ralgic stage, second the ataxic stage, and third the pseudo-paralytic or bed-ridden stage.

I prefer grouping the symptoms of typical cases into two stages only, viz.: a neuralgic pre-ataxic stage, and a second or ataxic stage. The so-called third stage is simply an aggra-vation of the second without any new distinctive symptom.

I do not design to recapitulate the symptoms of posterior spinal sclerosis in this paper, chiefly for the above reason, and also because such a summary is accessible to every reader in Hammond's treatise on diseases of the nervous system, and in a lecture of my own on the " Diagnosis of progressive locomotor ataxia." [1]

Non-typical cases of posterior spinal sclerosis while by no

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[1] " Series of American Clinical Lectures," vol. iii., No. 12., N. Y., 1878. Seguin, " Opera Minora," p. 353, N. Y., 1884.

means rare, are yet often puzzling and misleading. A record of them is desirable, and remarks on their semeiology and probable pathology may not prove wholly devoid of interest.

Numbness, paresis, and ataxia preceding fulgurating pains :
antecedent scoliosis and syphilis.

CASE I.—A male æt. 35, a broker by occupation, single, seen in September, 1878. Former health good ; from youth has had an extreme right dorsal lateral curvature of the spine caused by persistent over-use of the right arm. Fourteen years ago, when 21 years old, had a chancre followed by some cutaneous eruption, but not by sore throat or osteocopic pains. Remained well until two years ago, when slight numbness appeared in the left foot and leg, and progressively increased. The right foot became involved only in the last few months. During the past summer has noticed progressive weakness of legs, slow micturition, diminution of virile power. Has noticed no abnormal reflexes, spinal pain, cincture feeling, symptoms in hands or head.

Admits no sexual excesses and no injury to spine. The curvature is as it has been for many years.

No neuralgic or fulgurating pains in legs.

The examination showed weak but not ataxic legs ; left leg weaker. Marked anæsthesia of soles of feet and toes to æsthesiometer and needle. No muscular atrophy. The patellar tendon reflex and that from the soles of the feet are both lost. No mention of state of pupils.

A thorough anti-syphilitic treatment by means of mercury and iodide of potassium was carried out very carefully by the patient's physician, Dr. T. E. Satterthwaite. This was repeated afterward from time to time.

The consecutive notes of this interesting case are incomplete, but as the patient is still under observation I can give a fairly correct idea of the course of his disease. The paresis passed away in great measure. The numbness and partial anæsthesia remained, extending to the knees. Distinct ataxia, aggravated by closure of eyes, developed in the second year of observation (third of disease), and the first fulgurating pains not till 1880 or 1881, and these were rectal pains, apparently neuralgia of the rectum. Since 1881, occasional pains, sharp, momentary, or burning, in patches, developed coincidently with a low barometer, have occur-

red in the thighs and legs. These have never been severe or long
continued ; in marked contrast to the usual course of tabes.

The bladder and sexual organs recovered their power and
remain normal. This, together with increased firmness in gait,
constituting a veritable arrest of the disease, was brought about
by nitrate of silver internally, spinal galvanization, and more
especially by a course of spinal douches, done under the direction
of Prof. Charcot in Paris during 1881.

At no time have the eyes presented symptoms ; no diplopia,
amblyopia, or Argyll-Robertson pupils. The arms remain nor-
mal. During the past winter only a few neuralgic pains have
occurred, there was some increase in numbness and staggering,
but the ataxia was no greater, and the patient has been able to
attend to his business as a broker (office work only) with great
regularity.

At the beginning this case presented the clinical picture
of a subacute syphilitic myelitis in the lower part of the
lumbar enlargement. In its second stage, where it now
stands arrested (?) the symptoms consisted in ataxia, partial
anæsthesia, absence of patellar reflex, and slight but charac-
teristic fulgurating pains in the rectum and legs. Entirely
abnormal to the usual semeiology of tabes are the absence
of symptoms about the eyes, and the inverted order of
appearance of the pains.

It might be argued that the case was one of central
myelitis very low down at first, with secondary changes in
the posterior columns, or more properly the columns of
Burdach for a certain distance up the lumbo-dorsal cord.
Considered in this way, the case (as well as the following)
might be taken as favoring the theory that posterior
spinal sclerosis is sometimes a secondary and degenerative
lesion.

As regards therapy and prognosis the case is interesting.
Anti-syphilitic treatment was most clearly called for, and it
was carried out very thoroughly, the gums being slightly
touched by mercury and iodide of potassium given in quite
large doses up to 15. per diem. And the same remedies were

used more than once in smaller doses afterward. The symptoms of myelitis apparently yielded in part to this treatment, but the more strictly tabetic symptoms appeared and persisted. The unmistakable improvement, or check of the disease was obtained later by remedies which are more especially of use in spinal sclerosis, viz.: spinal douches, galvanism and nitrate of silver.

Acute double sciatica, followed by ataxia of the legs.

CASE 2.—A male, aged thirty-two years, married, a merchant by occupation. Seen July 6, 1880.

Was perfectly well until three weeks ago. Had a chancre in 18—. Developed ten days after coition, followed only by "a few pimples."

About June 16th, after a hard day's work in New York calling on many friends, became much heated, and drank freely of cold lemonade. The next day had pain in abdomen and took Congress water without effect. On Tuesday, June 22d, had very severe pain in both sciatic regions, extending to the toes, most acute under the knees ; no numbness. On the 24th came to the city from his country home, with same pain in both sciatic distribution ; a sense of painful pressure and burning in the epigastrium. No loss of power in the legs. Iodide of potassium and salicylic acid were given freely without relieving pains, which were so severe that he had to use laudanum to obtain any rest. The pain was continuous, not stabbing or fulgurating. On the 27th still suffering the same bilateral sciatic pains ; numbness appeared in the feet, rising steadily. On 28th could still walk pretty well, but from the next day (29th) noticed "weakness" of legs ; the bladder acted slowly and imperfectly ; there was pain in the dorsal part of the spine extending into the epigastrium. In the last two or three days the spinal pain has extended to level of the shoulders. The sciatic pain has ceased. The numbness is severe up to knees, and there is slight loss of sensibility of the skin, to level of waist ; a trace of numbness has appeared in the fingers, cannot stand or walk without assistance. Has partial retention of urine and constipation. The muscles of the lower limbs are uniformly though but slightly atrophied. In sleep frequent jerking of legs.

Examination showed some paresis and slight uniform emaciation of the lower extremities. The patient can stand with assistance, but closing his eyes makes this impossible. The bladder is

full of urine, and the catheter draws off three pints. There is neither plantar nor patellar reflex. The chief symptom, however, is typical ataxia of the legs in the attempts to stand and in tests performed while lying on the back.

Without complete anæsthesia, there is marked diminution of sensibility, especially in the right lower extremity. The feet feel numb. No pupillary or other ocular symptoms, and no symptoms in the upper extremities.

The patient had had a chancre some years before, not (?) followed by secondary symptoms ; his body is free from cicatrices, and he has two children who are pictures of health. (A third healthy child was presented him by his wife in the year after his attack.)

The patient denied in the most formal manner having had any pains in his legs prior to the attack.

Treatment consisted in the systematic emptying of the bladder twice a day with carbolized catheters ; the use of small doses of mercury, and of full doses (up to 5. three times a day) of iodide of potassium, and the application of the galvanic current to the spine and legs. At the end of July was given strychnia.

A peculiar symptom was a severe " griping " pain in the left side of the thorax, from the shoulder forward at the level of the seventh and eighth intercostal spaces. The time of appearance of this pain is not noted, but on July 8th it is " nearly gone," and afterward gave patient very little trouble.

On August 8th the first attack of fulgurating pain is noted, as a stabbing, cutting pain in the internal aspect of the left knee, lasting eight hours.

The case was under observation and treatment two years, during which a certain improvement occurred. The muscles of the legs regained their size and power, the sensibility in a great measure returned, and the bladder (after two attacks of cystitis) recovered its function. But the ataxia remained, though diminished, as the patient was when last seen able to walk with one cane on a sidewalk or piazza several hundred yards, though with characteristic jerk. The fulgurating pains were experienced occasionally during the two years, less frequently, but just as severe and typical. The left side of thorax, though free from pain, was still the seat of a pressure paræsthesia.

This interesting case was quite tabetic in its character after the first eight weeks of its course, the symptoms then being fulgurating pains, ataxia, slight anæsthesia of the legs and

absence of patellar reflex. In its beginning, however, it is quite anomalous, and it is quite probable that the primary lesion was one localized upon the posterior columns of the cord at the end of the seventh or eighth dorsal vertebræ, mostly on the left side of the median line. Such a lesion would account for the severe epigastric and abdominal symptoms experienced at the beginning (dorso-spinal and gastric sympathy is well illustrated in spinal irritation cases), the distinctly localized pain with sense of griping or grasping in the left side of the thorax, in the seventh or eighth intercostal spaces. Such a lesion would also pretty well account for the seeming double sciatica. Many years ago, Cruveilhier showed that *paraplegia dolorosa* was almost pathognomonic of tumor compressing the spinal cord.

This supposed lesion was checked by treatment (?) but not before the conducting power, both for sensibility and for coördination, of the posterior columns had been seriously impaired. In the third week, when first seen, the ataxia of the legs was already extreme. There were also other signs of compression of the dorsal spinal cord, viz.: paresis of the legs and of the bladder (retention). In the seventh or eighth week, and later, the fulgurating pains showed themselves in various parts of the lower limbs, indicating slow sclerotic (or degenerative?) changes in the columns of Burdach below the level of the eighth dorsal nerve.

It is interesting to note in support of the theory of a primary localized lesion that while the thoracic pain was upon the left side, the opposite, right lower extremity was more anæsthetic than the left.

In spite of the absence of secondary symptoms and of transmission of syphilis to offspring and wife, it is possible that the lesion was a specific formation either in the dura mater or more probably in the external layer of neu-

roglia. Its increase was arrested at a certain point, but not before irreparable damage had been done to delicate nerve structures. The question has always been in my mind, would a very active treatment, by means of mercury and large doses of iodide of potassium at the very beginning of the spinal symptoms (fifth day of attack), have saved the patient's legs from permanent disability?

Precocious atrophy of optic nerve; locomotor ataxia.

CASE 3.—Mr. G. C., æt. thirty-six, seen in August, 1878; referred by Dr. Thos. R. Pooley.

About four years ago simultaneous appearance of diplopia, tendency to stagger or walk badly, and specks before eyes. Is positive that at that time and previously he had had no pains in his legs. In the course of a year the diplopia, which was due to paralysis of the left sixth nerve, diminished, but the sight of the left eye failed. From that time vision gradually became worse until lately he has only had perception of light. Dr. Pooley finds extreme atrophy of both optic nerves.

In the last few months patient has had somewhat sharp pains in patches upon the legs and thighs, occurring semi-periodically. The urine has been passed slowly of late. Denies any feeling of numbness in feet, but has had a sensation as of a ball under his feet, and has felt as if treading on rubber. Patient is aware that his staggering is not accounted for by blindness.

Sixteen years ago he had a chancre followed by "warts at the anus," but no other symptoms. Children healthy.

Examination : Optic nerves atrophied, but pupils are "equal and normal" (notes taken at the time). No symptoms in arms. Legs strong but distinctly ataxic ; more so when eyes are closed. The soles of the feet are slightly anæsthetic, but pricking is well felt. Absence of patellar reflex. No arthropathies or muscular atrophy.

This case belongs to a category which I suspect is not small. At least I have met with several such in which the amaurosis was coincident with or antecedent to the ataxic stage. At the present time there are two cases under my care in which, with very little ataxia, there exists complete loss of vision, in one case with atrophy of the optic nerves, in the other with slight ophthalmoscopic signs.

What is interesting to note is that in such cases we have not to do with an extended longitudinal sclerosis (at least judging by clinical signs), for in these three cases the arms remained normal at the time of last examination. The lesions in the optic apparatus and those in the dorso-lumbar cord doubtless arise under the pathogenetic law of sclerosis, which at present is wholly unknown to us. Cases of this variety, in which the optic apparatus suffers only, and the more numerous cases in which paralysis of one or more ocular muscles precedes (sometimes by years) the first or neuralgic stage of tabes, constitute an almost insuperable objection to the theory that posterior sclerosis is a degenerative lesion secondary to disease of peripheral nerves— an ascending degeneration.

Extraordinary prolongation of the pre-ataxic or neuralgic stage (29 *years*).

CASE 4.—In 1878 I was consulted by an artist, 57 years of age, for a " neuralgia," which had tormented him from his thirtieth year. The pains affected the lower extremities only until two or three years ago, when they showed themselves in the arms as well. Patient describes these pains as sudden, sharp, tearing, sometimes of atrocious severity, occurring in spots or patches of round or oblong outline. These pains recur in one spot for some time, varying from a few minutes to hours and days. In the course of these many years he has had foci of pain in nearly every part of the lower extremities, more especially near the knees and ankles. In the last few years the intervals between paroxysms have become shorter, and the pains have grown more severe. There is now mydriasis of the right eye, a condition which has existed thirty years without diplopia. A mere trace of numbness has made its appearance in the legs, detected only at times by rubbing the skin. The painful spots are hyperæsthetic during the paroxysms. In the last few years the urine has passed slowly. The floor or ground feels normal under foot ; no difficulty in walking. Examination shows dilatation of the right pupil, without diplopia ; no changes in the optic nerve (patient worked at his art to the last). No ataxia of the upper and lower extremities. There is very slight staggering when patient attempts to stand with eyes

closed. The soles of the feet show slight anæsthesia to æsthes-iometer test. Reflex from ligamentum patellæ lost. No paresis.

About two years after this first examination, Mr. A. died of a combination of renal and cardiac diseases. His spinal symptons had remained unchanged ; no ataxia at any time.

The diagnosis of posterior spinal sclerosis was verified in the post mortem examination of the spinal cord ; a distinct sclerosis of the lateral parts of the posterior columns was found.

Prolonged neuralgic stage (12 *years*)*; early arthropathies.*

CASE—5. A male patient sent to my clinic in 1877(?) by Dr. C. Williams. Has had characteristic pains in the legs for 12 years ; spots of pain hyperæsthetic at time of attack. Slight numbness of feet ; swelling in both knees in last two years ; no difficulty in locomotion.

Examination shows moderate anæsthesia and analgesia in feet and legs to knees ; absence of patellar tendon reflex. Chronic arthritis of both knee-joints with crepitations. Careful tests with eyes open and closed revealed no staggering or ataxia.

Prolonged first stage; development of general paralysis of the insane before ataxia.

CASE 6. An ex-army officer seen in July 1878. He was then 35 years of age and apparently in good health. Was much exposed during the war in 1864–5, and in the latter year had typho-malarial fever. Then enjoyed better health for several years. In 1876, while on duty in the far West, had two attacks of "cerebral con-gestion," in one of which he fell unconscious. This was fol-owed by poor health, depression, and hypochondriasis ; was almost insane on the subject of abuse by brother officers, official neglect, etc. Left the army and seemed well again, though a strong feeling of professional disappointment was prominent in his mental state.

Mr. B. consulted me for a peculiar "neuralgia." As far back as 1872 he had had attacks of cutaneous pain, becoming more and more frequent and severe. Attacks irregular as to time and loca-tion, mostly below the waist ; a few lately in the arms. Pain is sharp, cutting, and tearing, affecting round or oval areas in the skin and subjacent muscles ; not at all in the course of nerve-trunks. The pains were at times extremely severe, and their seat was nearly always hyperæsthetic.

Has had no numbness, vesical or optic symptoms. No sexual excitement.

Examination showed absence of patellar tendon reflex, and a little staggering when standing with eyes closed.

In 1881 I met Mr. B., but under such circumstances that I could not examine him. I was able to observe, however, that his pupils were extremely small. He seemed to stand well during the conversation.

During 1883–4 the case rapidly developed into a very well-marked one of general paralysis, with exaltation. The following details were obtained from Mrs. B.:

Excepting for attacks of fulgurating pains Mr. B—— seemed fairly well until 1882. During the winter of 1882–3 he was often depressed, and was oftentimes found weeping and sobbing in his library. At other times was bright, hopeful, and even "high" without actual delusions. Of these abnormal psychic states the depressed periods were longer and more marked. During the summer of 1883 delusions and exaltation appeared. At times considered his wife insane; at others blamed her for his illness, because of refusal to have complete sexual intercourse. After he was placed (July, 1883) in the private institution where he now lives, he declared that his wife had feigned his insanity to get him incarcerated! Letters written in November, December, 1883, and January, 1884, are typical of general paresis in composition and mechanical execution. I saw him in February and he remembered me perfectly, as also my diagnosis of posterior sclerosis. He laughed at this, and stiffened out his leg and arm, and strutted about to show me how absolutely free from ataxia he was. He appeared prematurely aged; his speech was quick and quivering; his facial and lingual muscles showed fibrillary tremors. His walk was slightly ataxic, and there was no patellar reflex. The pupils were unequal in size and did not respond to light and shadow. During the past spring the patient had two epileptoid attacks, with semi-coma. This was followed by temporary right hemiplegia and aphasia. Later he was reported as quiet, childish, and full of exalted notions.

From 1872 to 1882, a period of eleven years, the chief symptoms in this interesting case were the fulgurating pains, absence of tendon reflex, and fixed pupils (?). The ataxia observed during the present year is hardly as distinct as we see it in ordinary tabes, and the walk resembles that of general paretics.

Cases of tabes terminating with symptoms of general paralysis are not very rare, but in all I have seen, the spinal symptoms were complete and advanced before signs of cerebral degeneration showed themselves. In the case related it seemed as if the dependence between the cerebral and the spinal lesion was doubtful. From what we know of the pathological anatomy of the two affections, it would seem that Mr. B—— had only a slight sclerosis of the columns of Burdach (the posterior radicular zones) at the same time that his cortex cerebri was the seat of advanced and rapidly progressing inflammatory action.

EDITORIAL.

NOTES OF A VISIT TO EUROPEAN MEDICAL CENTRES.

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NOT one of the European medical centres can compare with Berlin in the progress which has been made in the past decade. The new buildings of the chemical, physical, physiological, and pharmacological Institutes, the Surgical Polyclinic on Ziegel Strasse, the Woman's Hospital, and the pathological Institute of the Veterinary College, all beautifully built and splendidly—aye, elaborately—equipped, fill one with astonishment, and Yorick's phrase rises to the lips modified to : " They order this matter [of medical education] better in Germany." In addition, the city hospitals, at the Moabit and Friedrichshain are important new clinical laboratories, which supplement the Charité and the smaller institutions, such as the Bethausen, the Augusta, and the Jewish Hospitals. There may be disadvantages in the paternal form of government under which our German colleagues live, but these are not evident in a survey of their university and hospital arrangements. Could the figures be obtained, it would be interesting to compare the total expenditure upon these in Berlin during the past ten years with that of London or New York. The conditions, of course, are not properly comparable, as private enterprise can scarcely enter into competition with lavish government expenditure. The progress so striking in medical institutions has been in keeping with the rapid development of the city

since the consolidation of the empire. From a dirty, ill-drained, mal-odorous, second-class capital it has changed to a bright, well-drained, bustling metropolis. Intellectually, too, it now holds the same position to Germany as London and Paris do to England and France. True, Leipzig and Münich are still formidable and successful rivals in certain departments. The medical societies are not excelled by those of any European capital in the number and importance of their scientific communications. In former days Virchow's voice was heard occasionally at the *Académie de Médecine* of Paris telling of some brilliant pathological discovery ; now Koch stays at home and expounds his discoveries in anthrax, tubercle, or cholera at the *Berliner medicinische Gesellschaft.* The number of students has steadily increased, and now reaches, in the medical faculty, about 900. Foreigners do not frequent the classes in such numbers as in Vienna. The system of short practical courses, specially designed for them, does not exist, but the "*fereien*" courses, in March and September, are attracting many English and Americans, and are becoming very popular. Many of the classes mentioned in the calendar after the names of docents and extraordinary professors are not given unless a sufficient number of students are forthcoming ; and, as this is not always the case, it not infrequently happens that foreigners, attracted perhaps by some special courses which they see announced, are disappointed and dissatisfied.

The Pathological Institute is but little altered, and it was very pleasant to sit in the same seat and attend again those celebrated demonstrations on morbid anatomy, the remembrance of which since 1873 had remained as an incentive in humbly following in a similar line of teaching. The splendid example set by Professor Virchow and his pupils in the manner of teaching morbid anatomy and the general technics of autopsies has been badly followed by British and American schools. For any one imbued with the spirit of Virchow's methods there is nothing more painful than to witness the ordinary hospital post-mortem, done perhaps by a junior assistant. The subject is one far too much neglected in the average college course in this country. Too often a student

completes his curriculum without the opportunity of making an autopsy, and without any instruction in details or methods, and as to a practical knowledge of the morbid appearances of organs, he is lucky if he has had a chance to feel a pneumonic lung or see a fatty liver. And yet, within a few months of the obtaining of his doctorate, he may be called upon in a coroner's court to give important evidence requiring a fair amount of pathological information. It is not, of course, practicable in all our schools to have well-equipped pathological laboratories, and in many good institutions the number of post-mortems annually available is small —not perhaps more than one hundred, but even with this number regular and systematic instruction can be given in the methods of performing autopsies; while a weekly demonstration on the fresh specimens, with "pickles" from the museum, will form a class at once practical and popular. At the end of two such courses a man will go up for his doctor's degree knowing the difference between hypostasis and congestion, and in exposing the calvarium will not begin his incision in the supra-orbital region. To their great loss, English and American students at Berlin do not attend this class in any number. As a teacher, Professor Virchow's vigor is unabated, and the care and thoroughness with which this great master performs an autopsy before the class is a lesson to be laid to heart. The laboratory at the City Hospital, Friedrichshain, under Dr. Friedländer, also offers unusual pathological advantages. The amount of material is as large as at the Charité, but no special instruction is given. The facilities for the study of the morbid anatomy of the domestic animals have greatly improved within the past few years. The new Pathological Institute of the Veterinary College is admirably arranged, and so far as horses and small animals are concerned, the material is abundant. The abattoir offers a very extensive field of observation, and one which can be freely utilized, owing to the kindness of Dr. Hertwig, the Veterinary Superintendent, and Herr Dunckler, the Pathologist. Except the contagious diseases, which, of course, are rigidly excluded, examples of all the ordinary diseases of cattle, sheep, and swine can be readily seen. It may be safely

affirmed that nowhere can parasitic affections be more easily studied ; but more on this subject when I refer to the modes of inspection carried on at this institution.

The special difference between the pathology of to-day in Berlin, and of ten years ago, is the extraordinary development of the experimental and culture methods applied to micro-organisms as the agents in the causation of disease. In this direction the Pathological Institute has been thrown somewhat in the shade by the *Reichsgesundheitsamt*, where Dr. Koch has done so much good work. One is startled at the rapid diffusion of a knowledge of these matters among the laity, explicable, no doubt, by the presence last year of the Hygiene Exhibition, and the demonstrations and lectures then given on the subject of germs and their development. The properties of various bacilli form subjects for table talk and, naturally, the amount of nonsense and pseudo-science which prevails is what might be expected. Everywhere the culture apparatus is seen, and it is rare to meet an assistant who has not got something under cultivation. There are no sceptics, at least, if there are any, they are "lying low" for the present. There were even murmurs against Virchow when, in the Reichstag, speaking on the cholera bacillus, he warned the members not to think the question finally settled with its discovery, and hinted that we were no nearer the eradication of consumption with all our knowledge of tubercle bacillus.

The relation of micro-organisms to anthrax and tubercle is accepted as quite settled, but the discussion wages hotly about pneumonia, diphtheria, puerperal fever, and cholera. On the last-named disease, the recently-published communications of the Berlin Conference have given much fuller and later details than were at my disposal. There can be no doubt of the constant presence of a peculiar bacillus-like organism, but of its precise relationship there will be for some time differences of opinion. Dr. Koch's communication will carry conviction to the minds of many ; those who know him best and who know his conscientious and painstaking mode of working will accept his conclusions without hesitation. The magnificent ovation which he received

on his return from India, and the handsome allowance granted
by the Government were tributes to honest work and modest
worth.

The attitude of many prominent men at the discussion on
pneumonia, at the German Medical Congress, showed the temper
of the times.   There was an evident disposition to accept as
specific the micrococcus which has been found in the exudation
and sputum.   Professor Jürgensen, who opened the debate, was
most positive in his statements and treated the question as if
practically settled.   The facts of the case are briefly these : nu-
merous micrococci are in the exudate within the air-cells in the
sputum, but are not discoverable at all stages.   An investing cap-
sule was thought, at first, by Dr. Friedländer, to be a distinguish-
ing feature, but it has been shown to be present in some cocci
from the mouth.   It is capable of cultivation on gelatine, and the
form of growth is somewhat peculiar, possibly distinctive.   In-
oculation with the cultures, or the fresh exudate, induces a fatal
disease in mice and guinea-pigs, characterized by serous inflamma-
tions and patches of lung consolidation, which is regarded as true
pneumonia.   Whether these cocci are peculiar to the disease or
whether they are only the normal buccal and respiratory micro-
cocci which have found in the exudate a suitable nidus for de-
velopment, and whether the disease induced in mice and guinea-
pigs is any thing more than a septicæmia, are questions which re-
main to be settled.   Dr. Klein has written strongly in favor of
this view.   The micrococci are often difficult to demonstrate.   The
method recommended by Friedländer, and which gives good re-
sults in many cases, is that of Gramm (methyl-violet and iodine
solution), but even when it fails we must not conclude that all
cocci are absent.   Professor Weigert has, on several occasions,
demonstrated to me numerous cocci in the exudate cells in pneu-
monic lungs by a method which he has not yet published, when the
ordinary methods proved quite futile.   The communication of
Emmerich is a remarkable one ; he found in the stuffing between
the floors of the dormitories of the prison at Amberg a micrococ-
cus which he believed had been the cause of the repeated out-

breaks of pneumonia in the institution at intervals during the past twenty-five years. He cultivated it and produced a disease in animals similar to that described by Friedländer. Sand and mortar, the composition of the stuffing, do not seem to offer the most favorable nidus for the maintenance of micrococci, but in this instance even such a barren soil is referred to as crowded with colonies of these tenacious organisms. We want more light on such cases.

In spite of the amount of labor spent on the micro-organism of diphtheria, we seem still far from full and accurate knowledge of their characters and relations to this terrible affection. Dr. Löffler, one of Koch's assistants, has been doing a good bit of work on the subject. Among a multitude of bacteria and micrococci which are found in the membrane and adjacent tissues, two forms appear to have a possible connection with the disease—a chain-like micrococcus and a rod-shaped microbe with an enlarged end. Cultivation of the former and inoculation of it into animals kills them, and similar bodies are found in the internal organs ; but there does not appear to be the slightest connection between the affection thus induced and diphtheria. On the other hand, cultures of the rod-shaped organism proved fatal with production of diphtheritic membrane at the site of inoculation, swollen glands, serous, and hæmorrhagic effusions, etc., and extensive diffusion of the microbes throughout the body. Curiously, these cannot be again cultivated—a very weak point in the evidence. The membrane which is produced by the inoculation of the rod-like body is practically identical with that of diphtheria. Dr. Löffler's specimens and animals were particularly interesting, and we may anticipate good results from the continuance of his investigations.

So also with puerperal fever. We seem still far from the discovery of the true contagium. Chain-like cocci have been found by many observers in many cases in exudation, the blood, and the solid organs ; indeed, they seem to be the only forms of any significance which have been constantly met with. They are not distinguishable from the similar forms which occur in scarlet-fever, erysipelas and diphtheria. Pasteur and others have culti-

vated this microbe, as obtained from the blood during life, but without leading to any very definite results. A series of investigations is being conducted on the subject by Dr. Tomer of the University Woman's Hospital, in conjunction with Dr. Iovanovic of the *Reichsgesundheitsamt.* In one case of well-marked puerperal fever blood taken with every necessary precaution was found to contain the micrococci, and was cultivated on gelatine to the eighth generation. The results of the inoculation with the cultures thus obtained are, as Fränkel's observations show, very uncertain. The present state of our knowledge, while not enabling us to speak with any degree of certainty, justifies the anticipation that ere long more positive information will be forthcoming—information which, at any rate will throw light on the vexed question of the relation of puerperal fever to diphtheria, scarlet-fever, and erysipelas.

It is a curious circumstance that Actinomycosis, known in Germany since the publication of James Israel's case in 1876 and Bollinger's article in 1877, should, so far as human cases are concerned, be confined to the country of its discovery. So far, no instance has been recorded in England or America. It is stated that the case of Mr. Treves of London, did not turn out to be genuine. In France they have only just woke up to the existence of the affection, and the article in the *Revue de Médecine* for April last is quite exhaustive. No doubt careful observation will reveal cases in this country, where the disease prevails rather extensively in cattle, more so, indeed, than among German stock, judging from a somewhat limited observation of the latter. Being familiar with the disease in cattle it was interesting to have an opportunity of seeing a case in the human subject. A woman about 30 years of age was admitted into the Charité on March 1st suffering from abscesses in various regions ; one over the sternum very soon burst and formed an extensive ulcer. After about two months' residence, and a course of illness resembling chronic pyæmia, she died in collapse. The pus was examined during life, but no diagnosis was made ; it was thought possibly to be malignant pustule. The autopsy revealed numerous abscesses

about the size of a walnut in the subcutaneous tissue of various parts, some of them large and confluent, necrosis of the sternum and costal cartilages and perforation of the pericardium and thickening with union of the layers. Small abscesses in right ventricle, in the kidneys and liver, and in some of the bones. In the intestines there were ulcers and small abscesses, and in the colon a sort of diphtheritic process. In the pus from these widely-distributed abscesses were found the small grayish-yellow nodular bodies characteristic of the actinomyces. These can be seen readily with the naked eye and are quite distinctive—round in form and half the size of the head of a small pin. These granular bodies are usually more or less calcified, and the pus when rubbed between the fingers may feel quite gritty. In this case the actinomyces granules were softer, but each contained the well-defined radially arranged tufts of this most remarkable fungus. Chronic abscesses with bone disease have been the prevailing features of the majority of recorded cases of actinomycosis—twenty or thirty in number. This one was peculiar in the extent and character of the affection of the bowels ; the ulcers of the small intestines seemed directly due to the bursting of small abscesses, and the diphtheritic process in the colon appeared consequent upon the presence of the actinomyces in the deeper parts of the wall of the intestine. The teeth were carious, but there was no evidence to be obtained as to the origin of the trouble or the point of entrance of the fungus. Dr. Oscar Israel has cultivated the fungus, but there are still points in its biology which need clearing up. It is not a little remarkable that the affection should differ so in cattle and in man. In the former it is almost invariably local, confined to the jaw (lower), the tongue, or the pharynx, rarely occurring in the internal organs and not always producing active suppuration. Indeed, the majority of actinomycotic jaws which one examines present no suppuration. In man, on the other hand, the cases resemble chronic pyæmia, there is bone disease with multiple abscesses, and there is wide-spread generalization, as in the case here mentioned.

Additional interest has been lent this subject by the alleged dis-

covery of actinomycosis in swine—in the muscle, not in the jaw or bones. The fungus lies within the sarcolemma, and produces degeneration of the muscle substance, but no suppuration. The degenerated fibres can be seen as opaque white streaks among the normal ones. The observation of Herr Dunckler, at the Berlin abattoir, has been confirmed by Prof. Virchow and Dr. O. Israel, rather prematurely in the opinion of many competent observers, who deny that the appearances in question are in any way produced by a fungus. A careful study of many specimens has not been fully convincing, but of this more on another occasion and in another place.

Professor Goltz and his dogs excited no little attention in April, when his demonstration at the Medical Congress aroused the partisans on either side, and the question of cerebral localization for the moment became all-important. How old the question now seems! and yet it was but at the time of my last visit that Fritsch and Hitzig were making their famous observations. " Knowledge grows but wisdom lingers " may be well said of this subject, about which we have learned so much in the past decade, and yet seem to have so little of that *wisdom*, or full truth, which is above the reach of controversy. The dog which Goltz brought from Strasburg, was stated by him to have had removed the entire motor zone, as understood by Fritsch and Hitzig, at two operations, Oct. 10 and Nov. 18, 1883. The dog, to a superficial observer, seemed to behave in a perfectly natural manner, and was not paralyzed either as regards motion or sensation. The animal took food well, was friendly, gave the paw, and was quite ·intelligent. The sensation of the feet appeared to be a little dulled. Similar results always followed this operation, and Professor Goltz regarded the very foundations of the localization theory shaken by such experiments. Although not paralyzed, Goltz observed that animals from which large sections of the anterior part of the brain had been removed, presented a curious motor disturbance—a loss of delicacy and aptness in the movements. In gnawing a bone they did not hold it deftly with the foot, but there was a very evident clumsiness, and the same was most marked in their at-

tempts to take a bit of meat held up before the mouth—several
trials being needed for a successful seizure. There were one or
two curious reflexes in these animals—thus, when the root of
tail was rubbed, the tongue was protruded ; and when the head
was stroked, the animal would push the head against the hand
with force, and even make rotatory movements. Another curious
circumstance was the alteration in disposition consequent upon
removal of the anterior parts of the brain. The dogs became ill-
tempered, irritable, and in marked cases the condition resembled
rabies. This was in striking contrast to the state of animals from
whom extensive portions of the hinder part of the brain has been
removed, as they become, even if previously cross and savage,
quite good-tempered and confiding, as if the organ of mistrust
and suspicion had been removed. The dog was killed the follow-
ing morning at the Physiological Institute, and its brain given to
Prof. Fritsch for examination, and as in the case of the dog shown
at the London Congress, the destruction was not nearly so exten-
sive as supposed. Goltz stated that "the gyrus sigmoideus to
the level of the corpus callosum had been removed," and that the
sulcus cruciatus and the neighboring parts would be found want-
ing. It was certainly a surprise to many to find how comparatively
limited the lesion was ; in fact, the dog retained by far the larger
part of the motor area on both sides. At a meeting of the *Ver-
rein für innere Medicin* some weeks later, Prof. Fritsch showed the
hardened brain on which the limitation of the lesions could be
more accurately traced. Figures will no doubt be published, and
will show that this dog, like the London one, has not been very
favorable to its master's views.

Berlin possesses a model cattle market and abattoir, which pre-
sents many interesting aspects for the sanitarian, inasmuch as the
questions of disinfection, inspection, and the like, appear here to
have received unusual attention. It occupies a district of many
acres at the eastern border of the city, with special railway facili-
ties and ample accommodation for both market and slaughtering
purposes. The total expenditure has been about two and a half
millions of dollars. Of the cattle market we need not speak,

although the general arrangement and the modes of disinfection of cars, stalls, etc., are important sanitary questions. The abattoir is for the city and district, and private slaughtering is rigidly forbidden. With the exception of swine, the animals are killed in small stalls, not in large abattoir halls, as is customary here. This was a concession to the butchers, who can in this way have their private stalls. For purposes of inspection there is a staff of 141 persons, viz. : the Veterinary Superintendent, Dr. Hertwig, eleven Veterinary Surgeons, eight Inspectors of the trichinæ department, eighty-six microscopic examiners, thirty sample procurers, and four stampers. The inspection is both ante- and post-mortem. The former takes place in the stalls of the abattoir, and any condemned animals are handed over to the veterinary police. The post-mortem examination of cattle and sheep is entirely macroscopic and easily performed. Every carcass is thoroughly inspected within a few minutes after death, when, if healthy, it receives the proper stamp ; but if any parts are diseased, as liver or lungs, they are confiscated. The extraordinary number of 128 persons are occupied in the examination of swine, chiefly in the microscopic inspection for trichinæ. The coarse inspection is performed by veterinary surgeons, and is directed very largely to the detection of cysticerci (measles), tubercle, etc. Each " sample-taker " removes four pieces of muscle from each animal—from the rectus, abdomenalis, the diaphragm, the laryngeal muscles, and the intercostal—which are placed in a little numbered box, the number of which is stamped on the hog and entered in a book. When ten or twelve little boxes are filled, they are taken to the microscope room and given in charge of one of the inspectors. This department is most interesting, and constitutes an histological laboratory with eighty-six workers, half of whom go on duty in the morning, and the other half in the afternoon. Four of the inspectors direct each division. These workers form part of a large army of persons who are engaged in Germany in the examination of swine-flesh for trichinæ. To qualify for the position a person must receive a certain number of lessons in the microscope and in the examination of trichinous

flesh, and pass the prescribed examination. Each one provides himself—or herself, for there are many women engaged in the work—with a microscope, which must have a magnifying power of fifty or sixty diameters. The little boxes with bits of muscle are distributed among the workers, and from each bit six small portions must be teased up and examined microscopically. A great saving of labor is effected by the employment of a large plate-glass slide, 21.5 cm. by 4.5 cm., which is ruled into twenty-four compartments, on each of which a small bit of muscle is spread. A similar-sized plate of glass fits upon this, and is screwed down, so that by pressure the bits of muscle are well flattened, and any trichinæ which may be present are readily seen. If detected, the animal from which the muscle has been obtained is at once known, as a strict record is kept, and the carcass is confiscated and destroyed.

The following figures will give an idea of the value of the inspection. For the six months ending 30th September, 1883, there were killed (about) 44,000 cattle, 42,000 calves, 94,000 sheep, and 103,000 swine, in all 278,000 animals. Of these, 79 oxen, 9 calves, 6 sheep, and 697 hogs were confiscated. Of the total number there were found tuberculous, 681 oxen, 2 calves, and 765 hogs, and on this account 67 oxen, 2 calves, and 46 hogs were totally confiscated and 2,898 single organs. It is only when an animal is extensively diseased and emaciated that the entire carcass is destroyed—otherwise the tuberculous organs are alone confiscated. The great prevalence of tuberculosis in swine is noteworthy ; they appear in Germany to be more often affected than cattle. For the presence of cysticeri or measles 488 swine were confiscated—or rather boiled down for fat. There were 121 trichinous hogs—rather more than 1 per 1,000—two of which were also "measled" and several times a small distome was found in the muscle. Thus the 128 workers in this department during the six months found 121 trichinous hogs. It seems a small result for the enormous amount of time and labor expended, to say nothing of the cost of the inspection, but we must consider the other side of the question. A single badly-infected

hog may, if it escapes detection, spread disease and death broad-cast in a community given to raw *Schinken* and *Wurst.* The re-cent epidemic at Emmersleben illustrates this. The town and district had 760 inhabitants with one butcher and an old barber for meat inspector. The custom of eating raw chopped pork on bread was very prevalent, and on the 14th and 15th of September last a large amount of this was distributed among the villagers with the result in a few weeks of producing 257 cases of Trichinosis with fifty deaths. Even with inspection there is danger, particularly in country districts where the examination is liable to be careless, and where an inspector must possess unusual patience to examine, with perhaps negative results, several hun-dreds of animals, and keep up the necessary degree of watchful-ness. The only safeguard is in the total disuse of raw pork, but it will take many years to educate Germans to this point. There can be but little doubt that the immunity enjoyed by the people of the United States is due to the habit of thoroughly cooking pork which so generally prevails. Whether American swine are more often trichinous than the German is a ques-tion which has received very contradictory answers—answers which in some instances appear to have been given largely on com-mercial or national grounds. Virchow has stated that the dan-gers are greater from native than from American pork ; the latter is of course smoked and pickled, but the records of inspec-tion at Hamburg and Havre show, beyond a doubt, the great prevalence of trichinæ in the pork exported from this country. From 1878–1883 there were 335,840 inspections at Hamburg of American hams and sides, of which 3,470 were affected, and in the same period 304,725 inspections of native animals, hams and sides, of which only eight were trichinous. And when we remem-ber that time and again animals have been infected when fed with pickled or smoked trichinous flesh we are less surprised at Bismarck's vexatious restrictions and at the outcry in Germany at the laxity of the United States government regulations regard-ing the inspection of swine.

The two city hospitals are well ordered institutions, presenting

in many respects an interesting contrast. That at Friedrichshain, completed in 1874, is both medical and surgical, and has accommodation for six or seven hundred patients. Dr. Riess has charge of the medical wards and Dr. Hahn of the surgical. The situation of the hospital is magnificent—in the midst of a beautiful park, and the pavilions are far apart and surrounded by trees and shrubs. The buildings are very substantial, brick, faced with stone ; the medical portions of two stories, the surgical of one.

The abundant clinical material is not utilized for teaching purposes but visitors are warmly welcomed by the courteous directors, and a morning round on either side shows an extraordinary variety of instructive cases. The Moabit Hospital, under the charge of Dr. Paul Guttmann, consists of twenty-four pavilions of the simplest possible type. Each consists of a single ward with thirty beds, a small pantry, a nurse's room, and a waiting room. The construction is extremely plain—coarse brick walls and a thin board roof, covered with tar cement. There are large double doors at either end which can be opened wide for ventilation. The heating is by steam from a central building. The cost of each was about 3,000 marks. This hospital is largely for epidemic and contagious diseases, and has no surgical wards. The patients are drawn from the lowest classes in the city, and are often brought to the institution in such an enfeebled state that treatment is unavailing. The mortality is in consequence very high. Of 2,599 patients treated last year 566 died. On going through the Berlin hospitals one is struck by the appearance of the inmates who seem drawn from more impoverished classes than with us.

The custom of placing one or two men in charge of a large hospital seems odd to us and has both advantages and disadvantages. Thus, Dr. Guttmann is responsible to the city authorities for the care of about 350 patients at the Moabit institution and is, of course, allowed a staff of assistants on whom necessarily a large proportion of the work falls, and in some cases the treatment is entirely in their hands. At the city hospitals the rotation of assistants is much more rapid than at the University clinics,

where they gladly remain for years at small salaries for the sake
of the opportunity of making reputations as clinical workers.   At
the Charité the wards of Frerichs, Leyden, and Westphal are
clinical laboratories utilized for the scientific study and treatment
of disease, and the assistants, under the direction of the Professor,
carry on investigations and aid in the instruction.   The advanced
position of German medicine and the reputation of the schools as
teaching centres are largely fruits of this system.

NEW BOOKS AND INSTRUMENTS.

A Practical Treatise on Disease in Children. EUS-
TACE SMITH, M.D., Physician to East London Children's Hospi-
tal and to the Victoria Park Hospital for Diseases of the Chest.
New York : William Wood & Co., 1884, pp. 884.

In this volume Dr. Eustace Smith, already so favorably known
by his monographs on the wasting diseases of children, has given
the profession an excellent treatise, and one by no means super-
fluous in English literature. For, although the main outlines of
the subject are necessarily the same as in several other well-known
systematic treatises, yet they have been modified by Dr. Smith in
many details, so as to give a sufficiently individual stamp to even the
didactic part of his own descriptions. These are, moreover, admir-
ably illustrated by clinical histories which are extremely well se-
lected as types, not of routine cases of disease, but of the more
puzzling combinations of symptoms for which the less experienced
practitioner, especially, requires an authoritative precedent.

The classification of subjects in a systematic treatise cannot
fail to indicate the author's views on several points of doctrine.
It is interesting to compare the classification adopted by Dr.
Smith with those of Meigs and Pepper (7th ed., 1882), Henoch
(1881), and West (7th ed., 1884), who profess to make none.
Thus, under acute infectious diseases, Dr. Smith includes pertus-
sis, erysipelas, and cerebro-spinal fever. Meigs and Pepper define
the same group as " general diseases resulting from special morbid
agents operating from without," yet exclude from it pertussis,
which is placed among respiratory diseases. West assigns a chap-
ter to fevers, which includes typhoid, variola, measles, and scarla-
tina, but excludes every thing else, while not only pertussis but
diphtheria are referred to respiratory diseases. Finally, Henoch,
who has special and valuable chapters on diseases of the new-born

and of the lactation period, omitted in the other treatises, refers to them descriptions of erysipelas and syphilis, and again places pertussis among respiratory diseases, although distinctly recognizing that it rather belongs to the infectious group.

Dr. Smith's second chapter contains a singular grouping. Under the title " General Diseases not Infectious," he classes together rickets, ague, rheumatism, and gangrene. The usual place for rickets, among diathetic diseases, seems much more correct. Ague deserves to be classed etiologically among diseases due to specific morbid poisons ; and if the classification of gangrene is difficult, the difficulty is certainly not simplified by associating this singular affection with rickets and rheumatism. Dr. Smith is the only one of the four systematic authors we have mentioned who devotes a special chapter to spontaneous gangrene which he apparently identifies with Raynaud's " asphyxia of the extremities."

The lesion thus described, however is not limited to the extremities of the limbs, but may occur in scattered spots on any part of the surface of the skin, and is especially frequent on the genital organs. Gangrene of the mouth and lungs are considered apart. The occasional apparent development of pulmonary gangrene from a pneumonia, might seem at first to justify this separation. But the author points out that " in cases where lobar pneumonia ends in mortification of the lung, the gangrenous lesion cannot be looked upon as a natural consequence of the pulmonary affection. * * * The mortification of tissue is induced by something superadded to the original lesion," and this seems to be various conditions, embolic, or unknown, which will cause complete stasis in nutrient blood-vessels. By this, the proximate etiology is certainly assimilated to that of cutaneous gangrene, if, with the author, we accept the theory of Raynaud, that in "local asphyxia," there is a spasm of arterioles, followed by a migration of blood corpuscles and transudation into the skin. In cancrum oris again, the smaller bloodvessels of the diseased cheek are obliterated by coagulæ, and gangrene of the lungs and genitals frequently coincides. There is therefore no philosophic reason for assigning these three varieties of gangrene to as many different chapters. But for convenience of clinical reference, this sort of reduplication—in which the author skilfully avoids repetition—has considerable advantage, and several illustrations of the method occur in his book. It is remarkable, however, that Dr. Smith should admit that a nervous spasm of

arterioles, constituting attacks of local asphyxia which last but a few hours, should ever be the cause of gangrene. " Children, the subjects of this tendency to spontaneous mortification, are liable to attacks of what has been called ' local asphyxia.' * * * These attacks do not always subside harmlessly. In some cases the symptoms grow slowly worse, and the affected part becomes gangrenous." Much more consistent with the character of the phenomena is West's statement, that gangrene, of any locality, is a " blood disease." It really bears much resemblance to one of Pasteur's artificial septic diseases—malignant œdema ;—and it seems far from improbable that a special form of microbe will be found as the proximate cause of the neurosis in the human species.

Other unusual chapters in a treatise on children's diseases are those on leucocythæmia, lymphadenoma, enlargement of the spleen, anæmia, hæmophilia, scurvy, megrim, otitis and its consequences, spasmodic spinal paralysis, idiocy, fibroid induration of the lung, suppuration about the larynx, foreign bodies in the air-tubes, paroxysmal dyspnœa, ascites. Six chapters are devoted to diseases of the liver, and four to those of the kidney. Tuberculosis of the lung is treated with acute—*i. e.*, general tuberculosis, and a separate chapter consecrated to pulmonary phthisis. Dysentery is separated as a " specific disease," from non-specific simple inflammation, or entero-colitis. On the other hand, tabes mesenterica is merged in a general description of scrofula. " It is now known that the symptoms are due, not to the mesenteric swellings, but to the lesion of which they are the consequence, and that the caseous glands form a part, and often only a very insignificant part, of the disease." The author adds : " Of themselves they form a strong argument against the tubercular theory of scrofulous glandular enlargement : for caseation of the mesenteric glands, unless their size be such that they press upon neighboring parts, is in itself a by no means serious matter."

Bronchial asthma is described as one of the forms of paroxysmal dyspnœa, of which the others are stridulous laryngitis, pressure upon the trachea by swollen bronchial glands, and obstruction of a bronchus by a foreign body. True asthma is usually associated with emphysema, but may occasionally be a pure neurosis. The author notes as singular that this neurosis should be so rare in children, in whom other forms of nervous spasm are so common, " one of the peculiarities of early life."

These re-arrangements and partial reduplication of subjects, by consideration of them from more than one standpoint, help

to render Dr. Smith's treatise usually full and complete for practical reference. There are, however, omissions. Thus, as already mentioned, there is no chapter on diseases of the new-born ; none on diseases of the nose ; and the chapters on both heart and skin diseases are extremely cursory. The section on nervous diseases contains no chapter on hysteria. A regretable defect in the book is the entire absence of precise bibliographical references. No array of authorities is anywhere attempted, and discussions on rival opinions, and on pathogenetic reasonings are either brief or altogether omitted. References, however, to recent observations and experiments, are frequent and apposite, yet lose much of their value because it is impossible for the student to verify the quotations, unless already familiar with the author from which they are made.

Among such pathological experiments may be cited those of Braidwood and Vacher, who examined the air expired by measles patients, by making them breathe through glass tubes coated with glycerine. The microscope afterward revealed in this glycerine numerous sparkling, colorless bodies, spherical and elongated. The same observers confirm the observations of Naumann, on the great proliferation of cells in the rete malpighii, extending along the hair and sweat ducts into the glands ; and, in addition, claim to find in the skin the same sparkling bodies discovered in the breath. Similar cell proliferations in the rete mucosum exist in scarlet-fever, so that both these eruptions are removed from the category of hyperæmias. In scarlatinous uræmia, the potash salts of the blood have been found increased to three times the natural proportion, and of this two thirds were contained in the serum, and not, as in healthy blood, in the red corpuscles.

The opening paragraph in the chapter on anemia, sums up the physiological conditions which predispose to the disease, from the researches of Davis, Poggiale, Wiskemann and others. "It appears that, in infancy, although the quantity of blood is greater than it is in mature life, in proportion to the entire weight of the body, this blood is of lesser specific gravity, contains more white corpuscles, less fibrine and soluble albumen, a smaller proportion of salts, and a considerably smaller quantity of hæmoglobine. With this comparatively dilute blood, the growing child has to undertake a larger work than is required from the adult. He has to supply material for growth and development ; * * * the heart is forced to greater efforts to drive a sufficient quantity of blood along the relatively wider arterial channels ; the lungs, to

aërate the larger proportion of blood carried to them by a more capacious pulmonary artery. The lungs eliminate carbonic acid in far higher proportion than is the case in older persons. The amount of urea excreted by the kidneys is relatively much greater than it is in the adult. The work required from the different secretory and excretory organs, whose united labors go to build up the growing frame, may be judged from the fact that, within twelve months of its birth, the body has increased to three times its original weight."

This description is both concise and clear, but it seems to us to involve a certain confusion of ideas that is often met with on this same subject. The amount of hæmoglobine in the blood, *i. e.*, the amount of oxygen, does not require to be proportioned to processes of growth, but to those of function. When tissue-growth predominates over nervo-muscular function, the demand for oxygen diminishes. Thus, both in childhood and pregnancy the amount of oxygen is less, but the loss is not felt, for there is less functional demand to be supplied. Again, the wide arteries of infancy do not increase, but facilitate the work of the heart. And as the rôle of lung tissue in respiration is purely passive, it cannot be said to be "forced to greater effort," because more blood is brought to it by a wider pulmonary artery. Further, this relative activity of the pulmonary circulation, tends to diminish the dangers of pneumonia, even if it increase the frequency of the disease.

The chapter on scrofula, includes a brief description of spinal caries ; and might with advantage refer to other scrofulous diseases of the bones. The local consequences of glandular hypertrophy in the mediastinum are carefully described, and the various symptoms which result from their pressure upon blood-vessels and air passages. " It is possible that the bronchial glands may be occasionally the seat of tubercle, * * * but there is little doubt that the ordinary form of glandular enlargement is due to a very different cause " ; by which is meant the irritation of different lymphatics in subjects endowed with a " singular activity of all the epithelial structures." To this special activity the author attributes the luxuriance of the hair, eyebrows, and eyelashes ; the frequent scaliness of the skin, the rapid growth of nails, finally the peculiar tendency to engorgement of the lymphatic glands by proliferation of their elements.

The relations of scrofula and tuberculosis are touched upon lightly ; the influence of softening cheesy matter in setting up an

infective process, alluded to, as also the (as yet unsettled) debate on the rôle of the tubercle bacillus. The author observes that the "tissues of scrofulous subjects seem to furnish a congenial soil for the growth of tubercle." It is certainly not premature to suggest that it is this very soil which is required for the development of the parasitic organism.

The diagnosis of acute tuberculosis in young children is carefully considered, and especial stress laid on the symptom of œdema of the extremities in the absence of albuminuria. "In young babies the only symptoms of the disease for a considerable time may be slight fever, pallor, some loss of flesh, an inelastic state of the skin, and a little œdema of the extremities."

The discussion on enlargement of the spleen from "simple hyperplasia" is a useful addition to the usual chapters on abdominal tumors, or to the usual incidental reference to the splenic enlargements which occur in the course of fevers, malaria, rickets, and syphilis. The writer points out that although the spleen may be enlarged in amyloid degeneration, it may become amyloid without being enlarged. A case is described in a child with slight rickets, where the lower border of the spleen was found to reach to the left crest of the ilium. We have seen a similar case in a child eight months old. In a child of a year, the spleen reached to the level of the navel, and there were some signs of rickets. After five months' treatment with cod-liver oil, fresh air, and nutritious diet, the child had cut ten teeth; seven months later had cut sixteen teeth, and the spleen was only just perceptible below the ribs. It is advisable, observes Dr. Smith, not to give iodide of potassium, nor mercurials, except in cases of syphilis; but to pay great attention to the nutriment and digestion, to protection from cold, and for medicine, to rely upon iron, cod-liver oil, quinine, and wine.

An interesting, and again an unusual chapter is devoted to scurvy. "As one of the diseases to which young children are liable, it has been, until recent times, completely ignored. Lately, however, owing to the observations of Drs. Cheadle, Geo. F. Barlow, and others, a form of the malady has been recognized as an occasional consequence in infants of bad feeding and injudicious management. In such subjects the disease is commonly grafted upon rickets; and there can be little doubt that it is this conjunction of the two maladies which constitutes the state described by Fürst and others under the name of *acute rickets*."

That more ricketty children are not subject to scurvy is proba-

bly owing to the fact that many articles of food which preserve
from scurvy actually favor rickets. The deterioration of the
blood in scurvy is not caused by the mere absence of potash salts,
but by the absence of those salts in combination with organic acids.
The neutral salts, as the chlorides, are increased ; the alkalies di-
minished ; hence dissolution of blood corpuscles and fatty degen-
eration of the muscles and of the secreting cells of the liver and
kidneys.

One of the most characteristic morbid changes in infantile scurvy
is subperiosteal hemorrhage, a late symptom in the adult. Con-
versely, the affection of the gums usual in adults may be absent
altogether in children. Thus the earliest symptoms consist in
signs of pain and crying by the child when handled ; then cylin-
drical swellings of the limbs ; finally separation of the epiphyses
occurs, and crepitus may be detected on passive motion. At this
stage the patient, who hitherto has kept the limbs flexed, lies with
them extended and motionless, and no longer suffers pain from
handling. The principal difficulty in the diagnosis is the exclu-
sion of syphilitic pseudo-paralysis. In the latter case, says Dr.
Smith, the child suffers from "enlargement of the spleen and all
the signs of a profound syphilitic cachexia. The child is greatly
wasted ; is hoarse, and snuffles ; the cranial bones are thickened,
and the skin has the peculiarly dry, parchment-like appearance.
In scurvy the patients are not, as a rule, greatly emaciated.
Often their general nutrition is fair, and the special characteristics
of syphilis are absent. If the gums are spongy, or signs of hem-
orrhage can be noticed in the skin or elsewhere, the evidence is
strongly in favor of scurvy."

We do not feel sure that all cases of syphilitic pseudo-paralysis
do present such unmistakable evidences of cachexia. We have
certainly seen several presenting the clinical features of the bone
disease, accompanied by a specific eruption, and yielding rapidly
to corrosive sublimate baths, in whom there were no cachectic
symptoms at all.

Croupous pneumonia is regarded as a general disease with mark-
ed local manifestations, its exudation being peculiar to itself and
not to be produced by ordinary inflammatory agency. It should
be classed with tonsillitis ; is favored by bad drainage ; but cannot,
with our present knowledge, be attributed to specific infection.

The prognosis of croupous pneumonia is declared to be always
favorable—that of broncho-pneumonia always doubtful, a state-
ment whose gloom seems to us decidedly exaggerated, except in
regard to diphtheritic pneumonias.

The chapter on collapse of the lung is usefully divided between two special sections, congenital and post-natal atelectasis. Acute phthisis is separated from pulmonary tuberculosis, and the term "restricted to cases of rapid catarrhal pneumonia, when, as a result of an acute inflammatory process, the air-cells become stuffed with epithelial elements which undergo rapid caseation, and the solidified tissue quickly breaks down into cavities." The prognosis of *chronic* phthisis is not unfavorable in a child who can be put in the best sanitary conditions.

The chapter on jaundice, though principally occupied with jaundice of the new-born, contains no reference to Buhl's disease, or the acute fatty degeneration of the liver, kidneys, and blood-vessels in the foetus or new-born.

In the chapter on chronic Bright's disease is described a peculiar condition of "renal inadequacy," or diminished functional activity of the kidneys. "The disorder is indicated by pallor weakness, wasting, constipation, sometimes by sickness, and in every case by a remarkable absence of the natural elasticity of the skin. * * * There is no albuminuria, but the quantity of urine is small and the specific gravity low. Evidently sufficient solids are not discharged by the kidney, and the retention of effete matters in the system is apparently the cause of the symptoms." The average daily quantity of solids for a child should be five grains for every pound of body weight. A case is cited where the solids were no more than two and three quarter grains per pound. The remedy for such cases, which has proved successful, is brisk purgation, preferably by senna.

Directions for treatment are careful and precise throughout the treatise. Among these directions, however, we certainly should not agree to that on the quinine treatment of pneumonia. The author seems to speak less than usual from personal experience, for he says : "Quinine is strongly recommended by some authors as a valuable remedy * * * which is said to quickly reduce the temperature without weakening the heart * * * and for its supposed influence in checking the spread of the disease over the lung." The author advises "full doses," says that "children bear the remedy well," yet then recommends for an infant of twelve months only one grain three times a day, the quantity to be increased one grain and a half for every year of the child's life. These doses are really quite inadequate, and no judgment on the value of the treatment can be based on them. Dr. Smith also says that in case of great dyspnœa and threatened cardic failure

from over-distension of the right heart, he "should not hesitate to take one, two, or more ounces of blood from the arm." But he does not as yet seem to have practised his own suggestion. It is asserted, assuredly wrongly, that local treatment of erysipelas is useless. Now we have records of several cases where the eruption was arrested by a band of carbolic-acid painting. Dr. Smith quotes a new method by Barwell, application of a thick coating of common house-paint, but does not seem to have tried it. One treatment is "invariably" used by the author in pertussis : sulphate of zinc ($\frac{1}{6}$, $\frac{1}{4}$, $\frac{1}{3}$ of a grain) and atropine ($\frac{1}{2}$ drop of solution P. B.) twice or thrice daily ; the atropine to be gradually increased to dilatation of the pupil. Rheumatic pericarditis is treated by neither ice nor poultices, but by a blister and iodide of potassium, and great efficacy is attributed to the treatment. In the treatment of infantile syphilis, the use of sublimate baths is, we think unadvisedly, ranked far behind internal treatment by gray powder or the perchloride ($\frac{1}{52}$ to $\frac{1}{48}$ gr. at a dose). For anæmia, as in other cases indicating the use of iron, especially rickets, Dr. Smith prefers the acid salts as sulphate or perchloride to the iodide syrup. The latter, he says, often occasions gastric catarrh by promoting acidity and flatulence, and encouraging the excessive secretion of mucus. Unusually large doses of iron are recommended—thus, 5 grains of the exsiccated sulphate three times daily, or 20 to 30 drops of the perchloride as often to a child six years old. For purpura, in occurring suddenly in healthy children, the "old plan of energetic purgation is peculiarly valuable. Often in such cases a course of iron or other tonic is followed by no benefit whatever, while a few doses of some drastic aperient cause a prompt and final disappearance of all hæmorrhagic symptoms. * * * The best * * * is a combination of oil of turpentine with castor oil." For the treatment of megrim, Dr. Smith warmly recommends a combination of ergot and strychnia (10–15 drops of liquid extract of ergot with spirits of chloroform, and 2–3 drops of strychnia solution, P. B., three times a day). In most cases in young subjects, the attack itself may be "decidedly shortened by a dose (m xv–xx) of liquid extract of ergot with spirits of chloroform in camphor-water." The raw-meat treatment of inflammatory diarrhœa, formerly advised by Trousseau, is warmly endorsed by Dr. Smith. "At first it is only partially digested, and the decomposing residue gives a most offensive smell to the stools ; but after a few days, especially if pepsin be taken, the meat soon ceases to be visible in the motions. By the above

measures strictly carried out, the most obstinate cases can be arrested."

We might sum up this review with the observation, that Dr. Smith's systematic treatise is an excellent expansion of his earlier monographs, not profoundly analytic, but giving vivid, accurate, and sufficiently comprehensive clinical pictures of disease, interpreted without anacronisms, and from thoroughly modern standpoints.   [M. P. J.]

Diseases of the Heart and Thoracic Aorta. By BYRON BRAMWELL, M.D., F.R.C.P.E., Lecturer on the Principles and Practice of Medicine, and on Practical Medicine and Medical Diagnosis, in the Extra-Academical School of Medicine, Edinburgh ; Pathologist to the Edinburgh Royal Infirmary, etc. New York : D. Appleton & Co., 1884, pp. 784, with 317 Illustrations.

Dr. Bramwell is well known as one of the most energetic workers of the younger generation of physicians in Edinburgh, where he now holds—as he did at Newcastle-on-Tyne, his former home—positions in the Infirmary and extra-mural school, which ensure great clinical and pathological advantages. His work on the "Diseases of the Spinal Cord," published two years ago, was very well received, and has proved a most serviceable text-book for students. The present volume is, we are told in the preface, the outcome of fifteen years' study and observation on diseases of the heart, and the subject-matter of it was delivered, almost exactly as it stands, in the form of lectures to the author's class at the beginning of the winter session of 1883–84. The work bears many traces of its class-room origin, in the systematic arrangement, and in the innumerable—often tiresome—subdivisions of chapters and paragraphs. Here, as in the author's work on the "Cord," we are at once struck with the number and general excellence of the illustrations, in which respect it compares most favorably with all recent manuals on the heart. Dr. Bramwell is evidently a strong believer in the value of good figures, and of the whole number in the work more than half are original.

The preliminary anatomical and physiological observations are well up to date. Full use is made of Dr. Gaskell's work on the automatic mechanism of the heart, and of his suggestion that in man also it is possibly due to an inherent rhythmical property possessed by the muscle ; and also of the recent contributions to cardiac physiology from the biological laboratory of Johns Hopkins University. This chapter will be read with great interest by

many practitioners who have not ready means of access to recent literature upon these subjects. The author very properly insists, when speaking of the relation of the heart to the minute blood-vessels, upon the necessity of taking an *all round* view of the circulation, and not limiting our vision to the central propulsive organ.

Speaking of the dyspnœa, among the cardiac symptoms, the Cheyne-Stokes respiration is very fully discussed—perhaps too fully, as thirteen pages are devoted to it. The conditions under which it most commonly occurs are dilated and fatty right heart, atheroma of the coronary arteries and dilitation of the aorta, and the phenomena are probably to be explained by supposing that periodical variations occur in the amount of oxygen supplied to the medulla. The respiratory centre "is the seat of two conflicting forces : one tending to generate inspiratory impulses (the discharging portion), and the other offering resistance to the generation of these impulses (the restraining portion) ; the one or other alternately gaining the victory, and thus leading to a rythmical discharge." Venous blood excites the action of the discharging portion and depresses the action of the restraining portion, and arterial blood may be supposed to act in just the opposite way. The centre is moreover supposed to be in a state of irritable weakness. Now, to explain a paroxysm, we may suppose, starting at a period of apnœa, that the venous blood gradually excites the dyspnœa by arousing the action of the discharging portion, and in consequence of the excessive irritability of the centre the discharges become excessive, and a condition of dyspnœa is produced, but the centre becomes speedily exhausted and the dyspnœa subsides. By the rapid respiratory efforts the blood (previously venous) becomes arterialized, stimulation of the discharging portion of the centre ceases ; stimulation of the restraining portion is produced and has full swing, inducing the condition of apnœa. Six diagrams are given representing the changes supposed to occur at the different periods of the Cheyne-Stokes cycle. Altogether Dr. Bramwell's discussion on this point, though long in proportion to its importance, is exceedingly interesting and suggestive.

In chapter III. excellent details for the student are given upon methods of case-taking, and there is a good summary of the chief symptons met with in heart disease. On the somewhat vexed point of the reduplication of the heart-sounds the author is, we believe, quite right in stating that the necessary conditions—in the

first sound—are considerable asynchronism in the contraction of the two ventricles with diminished duration of one or other or both of the component parts of the reduplicated sound and a slow action of the heart.

One of the most unsettled questions in cardiac pathology relates to the mode of origin of the functional murmurs, and we find it here discussed at great length, twenty-one pages being occupied in its consideration. We have a most exhaustive analysis of the three views, viz. : (1) That the murmur is produced in the pulmonary artery ; (2) that it is due to mitral regurgitation, and (3) that it is caused by a constriction of the pulmonary artery by the dilated appendix of the left auricle. The arguments for and against the latter views are given in great detail, and the author concludes that the sudden propulsion of a large blood-wave of abnormal (spanæmic) composition into the pulmonary artery, which is possibly dilated, is the efficient cause ; at the same time he agrees with Dr. Balfour in thinking that in many cases of advanced chlorosis, the systolic murmur which is heard at the apex is mitral and due to regurgitation, but he also thinks that it is a distinct one from that heard in the second left interspace.

Pericarditis is the first disease considered ; the morbid anatomy is illustrated by eighteen figures, some of which are rather superfluous. Thus four plates are given showing the lymph and vegetations in the acute affection. Although a case is given, scarcely stress enough is laid on the occurrence of acute purulent (idiopathic) pericarditis, which is more common in children than is supposed. Among the accidental symptoms reference is made to the forms of mental derangement which occur in some cases, either as delirium, with the hyperpyrexia of rheumatic pericarditis, or as that peculiar mental derangement described by Sibson, Flint, and others—a taciturn melancholy with suicidal tendency, or in cases of hard drinkers it may assume the character of delirium tremens. Dr. Bramwell is very strong on tables of differential diagnosis, of which no fewer than seven are given in connection with pericarditis. We are sorry for the students in the medical class of the extra-mural school if they have the lively hatred of such tables which possessed the students of our time. Aspiration of the effusion is recommended when the action of the heart is seriously embarrassed, and in case of a purulent fluid the sac is to be laid open and a drainage-tube inserted.

The section on acute endocarditis—which is divided in acute and ulcerative forms—is well and clearly given. Ulcerative en-

docarditis is not thought to be a specific infectious disease like typhus. The clinical history is unusually full, and the types of *cardiac typhoid pyæmic* and *aguish* cases are recognized. The points of diagnosis are carefully given, and altogether it makes, perhaps, the best chapter on this disease in any English text-book. Under the treatment of endocarditis the question of the influence of the salicylates in rheumatism and upon the heart complications is fully entered into, and the author strongly advises the administration of full doses of pure salicin after the manner recommended by Dr. Maclagan, and thinks that " if this form of treatment were more vigorously carried out in the early stages of the attack, the frequency of endocarditis and other cardiac complications would be materially diminished."

The treatment of mitral regurgitant disease is divided into the periods of before and after the failure of compensation, and under the former, excellent general directions are given. The new remedies are not thought to be equal to digitalis in progressive cases. Arsenic is highly recommended as a cardiac tonic—one not enough used.

Chapter VI. is taken up with the consideration of acute and chronic endocarditis, hypertrophy and atrophy, and fatty degeneration. We were disappointed in not finding a section devoted to these not uncommon cases of hypertrophy and dilation, which are grouped under the unsatisfactory term—idiopathic. We want more light in the pathology of this class of heart cases. The patients are usually middle-aged men, powerfully built, often hard drinkers. They come under observation with all the signs of hypertrophy and dilation, the consequences of broken compensation, dyspnœa, and dropsy. After perhaps several such attacks, the patient finally succumbs, and on *post mortem* we find no valve disease and no renal affection, nothing, in fact, to account for the great hypertrophy and dilatation. We are accustomed to attribute the condition to hard work and alcohol, but how much is due to the one and how much to the other is very doubtful.

In connection with atrophy two plates are given of a very atrophic heart weighing only 1214 grs. (81 grammes), taken from a woman aged forty-five, dead of cancer.

In the chapter on cardiac neuroses, after speaking of neurotic palpitation, the important subject of angina is considered. Under the term *functional*, Dr. Bramwell includes a number of cases of heart-spasm and pain in young persons, under forty ; it may be called pseudo-angina, and is not often fatal, but it may run into

the more serious form. The pain is attributed to irritation of the sensory-nerve filaments in the heart walls; possibly due to spasm of the heart muscle—like the extreme pain of cramp. Possibly too, the nerves passing along the coronary arteries, which are so often found diseased, may be implicated, and Peter has found extensive changes in the branches of the cardiac plexus. There are no new suggestions on treatment.

In devoting only sixty out of seven hundred and eighty-four pages to aneurism and diseases of the aorta, we scarcely think our author allows a just proportion to such an important subject. Among the physical signs no mention is made of Surg.-Major Porter's valuable suggestion, that in cases of suspected aneurism a sensation of tugging at the trachea can be distinctly felt when, by elevating the larynx, the windpipe was put upon the stretch. The sign is only present when the tumor presses upon the trachea, but in some cases we have found it of great value. The remarks upon diagnosis are excellent. An extraordinarily rare and interesting case is mentioned of simple dynamic pulsation of the aorta, noted by the author and Dr. Murray of Newcastle. In the treatment of aneurism by iodide of potassium, the drug is stated to act by reducing the blood pressure and relieving the tension within the sac, not, as Dr. Balfour supposes, by acting on the fibroid and muscular elements of the sac. Small doses do as well as large ones. Chloral in 7-gr. doses three times a day is advised for the same purpose.

On the whole, the work is one which will prove of great value to students and practitioners, and Dr. Bramwell may be congratulated on the production of so excellent a text-book. [w. o.]

Diseases of the Throat and Nose. By MORELL MAC-KENZIE, M.D., London. Vol. ii., Diseases of Œsophagus, Nose, and Naso-Pharynx; with index of Authors and Formulæ for topical remedies. Illustrated. Philadelphia : P. Blakiston, Son, & Co., 1884, pp. 550.

In the preface we are told twelve years elapsed between the conception and birth of this book. If for no other reason than this assurance of its maturity, it is entitled to appear at a time when works in this specialty have become so frequent.

The gullet, the nose, diseases of the naso-pharynx, and an appendix on the contents, in as many sections. The anatomy of the part opens each of the first two sections, followed by a description of the methods of examination and of instruments, and the consideration of the various diseases by which the organ is

affected. The author introduces each disease by a list of its Latin, French, German, and Italian names. Then follows a definition, which most often is not a definition, but a translation of the Latin term with a few conditions and sequelæ. This we acknowledge is unavoidable, if definition is in all cases to be insisted upon. In medicine, too little is known for purposes of definition, and in most cases the attempt to define should not be made. Each disease is illustrated by the record of one or more cases.

At rare points the author exhibits a conservatism, but nowhere more so than in his adherence to the term "thrush," refusing to recognize the very natural division suggested by the parasitic character of one class of cases of thrush, and the non-parasitic character of the other class. This distinction has long been made by the French.

Farther on, we confess no little surprise that a disease as dangerous as gummous syphilide of the gullet should have its treatment disposed of in a short paragraph and summed up in 10-gr. doses of iodide of potassium.

The operation of œsophagostomy and gastrostomy, which of late have received so great attention in surgical discussions, are considered to a full extent under "cicatricial stricture of the gullet." Œsophagostomy is characterized as having "a narrow range of usefulness," as "a leap in the dark," and more "likely to find favor with the adventurous surgeon than with the careful practitioner." It is, however, recommended in syphilitic stricture of the upper part of the gullet, but the "diagnosis of syphilitic disease can never amount to any thing more than conjecture." Gastrostomy is classed with œsophagostomy in the following : "It can hardly be denied, however, that the benefit of these operations has often been shown more in the euthanasia which they have brought about than in any appreciable prolongation of the patient's life. In fact, judging from statistics alone, operative interference would seem to be attended with less satisfactory results than the milder palliative measures generally adopted." Apology is offered for the bad showing in the case of gastrostomy, and the prediction is made that its future will be more satisfactory. A case of cicatricial stenosis with gastrostomy is given in full, with notes of the post-mortem examination.

In the treatment of diseases of the nose, the author agrees, with others, in not having observed injurious effects from irrigation, but prefers sprays. We hold the "word of caution" in the treatment of hypertrophy of the nasal mucous membrane to be most opportune. With the snare and cautery at hand, the temptation

to operate seems to most, almost irresistible, where the author assures us that he succeeds "in effecting a cure by the simple removal of all causes of irritation and the persevering use of gentle dilatation." In the intractable cases, the electric cautery is recommended for the redundant tissue as "the most simple and efficacious."

Ozæna is given its right place. It is dethroned and given a place among the symptoms of a long list of different affections. The discussion of it comes here under the head of "Dry Catarrh" (which term the author defends against the etymological objection by Virchow). It may be observed that in considering the prognosis of dry catarrh, the contrast is drawn by implication between "dry catarrh" and "true ozæna."

Full consideration is given of the more recent discoveries in the relation between nasal tumors and cough, asthma, epilepsy, etc. But, the author denies that, the disposition to hay-fever lies in chronic hypertrophy of the mucous membrane of the nose.

This volume is most valuable to the general practitioner, as well as to the special student, because of the excellent selection of its subject-matter, its arrangement, its extensive bibliography arranged at the foot of the page with reference from the text, its completeness, and the unobjectionable work of the publisher.

[J. V. D.]

The National Dispensatory. By ALFRED STILLÉ, M.D., LL.D., and JOHN M. MAISCH, Ph. D. Third edition, Henry C. Lea's Son & Co., Philadelphia 1884, pp. 1755.

After an interval of five years a new edition of this now indispensable work comes to us much improved. It contains seventy-five pages more than the second edition, but the increase in material is much greater because the size of the printed page has been increased by nearly half an inch each way. This change in size of page was doubtless made to prevent the book from acquiring unwieldy thickness, but it is unfortunate in that it interferes with the shelving of the work with other large octavos.

The additions consist in new articles, more recent quotations of physiological and therapeutical experiments, and the insertion of nearly one hundred more illustrations. The general index has been elaborated and contains nearly four thousand more references than the former one.

As now re-written, the "National Dispensatory" constitutes a formidable rival to the various treatises on therapeutics and materia medica, both for students and practitioners. [E. C. S.]

The Editor of the ARCHIVES OF MEDICINE *regrets to announce the discontinuance of the journal with the present issue (December,* 1884).

The experience of the past year has convinced him that the verdict of the times is in favor of periodicals appearing at brief intervals, able to furnish scientific material and news with the utmost promptness and in a fresh state.

These considerations affect contributors and subscribers alike, and contribute to the preference for weekly issues.

In spite of such disadvantages, the Editor has received the most generous support within the past year, as well as during the entire six years covering the life of the ARCHIVES, *and to these friends, subscribers, and contributors he begs to offer his appreciative thanks.*

It is the belief of the Publishers and Editor that the volumes of the ARCHIVES OF MEDICINE, *of which a limited number of sets still remain, will remain a collection of no little value.*

E. C. SEGUIN, M.D.

NEW YORK, *December* 20, 1884

ARCHIVES OF MEDICINE.

Original Articles.

ON THE RUPTURE OF VEINS, WITH THE RE-PORT OF A CASE IN WHICH THE RUPTURE OF A DEEP FEMORAL VEIN WAS SUCCESS-FULLY TREATED BY LIGATION OF THE RUPTURED VESSEL.

By HENRY B. SANDS, M.D.,

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THE accidental rupture of veins, if we except varicose veins that are superficial, is an occurrence which is either unmentioned or barely alluded to in most of our standard works on surgery ; and the reason for the omission is obvious. As the accident is not a common one, and as it rarely proves fatal, its verification is difficult, and its pathology obscure. Nevertheless, an examination of the scattered literature of the subject teaches us that such lesions, although infrequent, are well authenticated ; that the exciting causes are often trivial ; and that the consequences are sometimes disastrous. The case I am about to relate shows that danger to life may be occasionally averted by operative interference.

The fact that the veins are liable to rupture did not escape the notice of the older pathologists, who have recorded some of the most remarkable examples of this lesion. Morgagni found a rupture of the azygos vein, the vessel being

extremely varicose.   Portal [1] describes a case of rupture of the superior vena cava, occurring in a woman who died suddenly in a cold bath.   After death a rent was found in this vessel, just above the right auricle, a large quantity of blood having escaped into the right side of the chest.   A similar case, in which the rupture took place into the pericardium, was observed by Helwin, and is recorded in Haller's " Physiology." [2]   Andral [3] relates the case of a man in whom the inferior vena cava gave way during a violent struggle.   The edges of the rent seemed as if they had been torn asunder, and the coats of the vein in the neighborhood were perfectly healthy.   Rupture of the internal iliac vein has been known to occur spontaneously.   The patient was a woman, apparently healthy, who was in the ninth month of her sixth pregnancy.   She awoke one night with a violent pain in her right groin and hip.   A physician was summoned immediately, but did not arrive until two hours later, when he found the woman in a state approaching collapse.   Twenty minutes after his arrival she died, without any sign of labor.   The body was examined by Sir William Blizzard on the following day, when the peritoneal sac was found distended with blood which had escaped from a rent in the internal iliac vein. [4]   Hey, of Leeds, saw a child in whom, after a fit of screaming, a hæmatoma appeared over the external jugular vein.   It was at first about the size of a pigeon's egg, but a fortnight later it had become very large, and extended from a point a little below the clavicle to the angle of the jaw.   It was partly evacuated by repeated punctures with a couching-needle, and afterward gradually disappeared. [5]

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[1] " Anatomie Médicale," tome iii., p. 355.

[2] Vol. i., p. 129.

[3] " Pathological Anatomy," Am. translation, N. Y., 1832, vol. ii, p. 255.

[4] *London Medical Repository*, 1814, vol. i., p. 456.

[5] " Practical Observations in Surgery," by William Hey, F.R.S., second ed., London, 1810, p. 487.

The cases of greatest surgical interest are those in which the ruptured vein is situated in one of the extremities. In such instances some mechanical injury is the most frequent cause of the lesion. The axillary vein has been torn in an attempt to reduce an old dislocation of the humerus[1]; and most surgeons of experience have met with examples of simple fracture, accompanied with hemorrhagic extravasations of unusual amount, due, in all probability, to a rupture of some large vein. When death does not speedily follow the rupture, the lesion of the vessel is generally repaired, and the extravasated blood disappears by absorption or otherwise. But in rare instances the vein remains open, and a blood-cyst is formed, which may continue for a long period, as is shown by the following example :

" Michael Callahan, a mariner, was admitted into St. Thomas' Hospital on the 30th of January, 1766, for a large tumor on the inside of the right arm. He said that this tumor immediately followed a contusion he had received, with the inside of the upper part of his arm against the stock of an anchor, about four weeks before his admission into the hospital ; that at first it was of considerable magnitude, but that afterward by some applications it was reduced to the size of a pigeon's egg. During two years it did not seem to grow any bigger, but afterward, upon his being attacked with a fever in the West Indies, from which he narrowly escaped, it gradually increased, and, when he came into the hospital, was considerably larger than a man's head, extending from the arm-pit, to within about two inches of the flexure of the cubit. The tumor was judged to contain blood ; and this opinion was strengthened

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[1] Froriep relates the case of a scrofulous patient, 26 years old, who was treated for a luxation of the humerus 20 days after the injury. On the second attempt, reduction was effected ; accompanied, however, with an extravasation which proved fatal in less than two hours. Post-mortem examination showed that the axillary vein had been torn completely across. (''Veraltete Luxationen," Weimar, 1834, p. 35.) A similar case is recorded by Callender, '' St. Bartholomew's Hospital Reports," vol. ii., 1866, p. 107.

by the man's declaring that a surgeon, either at Portsmouth or Plymouth, had punctured it, and observing nothing to flow but blood, closed the wound, which soon healed up. On the 22d of March, 1766, he died. The next day the body was conveyed to the anatomical theatre; and, while we were placing it in a proper position, the tumor burst, and about a pint of serous fluid was discharged.

" The first step taken was to open the thorax and pericardium, when all the large vessels springing from the basis of the heart were found, and of their usual size. They were traced to the neck; but they did not appear to be in any way diseased. The right axillary artery and vein were examined and found to be perfect. I next opened the tumor, and discovered it to be full of that coagulated mass which is always contained in old tumors formed by the extravasation of blood. I then began at the axilla to trace the artery, and found that it passed quite through the tumor, without any alteration with respect to its dimensions, and without any rupture or appearance of disease. The coagulated mass surrounded the artery intirely, but had not in the least corroded it, though it adhered closely in some places to its surface. I then intended to trace the axillary vein, and made a puncture into it, about an inch before it entered the tumor, into which I thrust a probe, and found that it passed easily on toward the mass. Upon putting my finger into the tumor I felt the naked extremity of the probe. I afterward laid bare the deep-seated branch of the basilic vein, which lies close to the brachial artery, just above the flexure of the cubit, and thrust a probe into it, which passed readily upward; and, upon introducing my finger again into the mass, I also felt the naked extremity of that probe. The parts remained in this state till the day following, that the physicians and surgeons of the hospital might see what

had been done. When I came the next morning I found that the probe, which I had left in the axillary vein, had been pulled out, and I could not readily hit upon the orifice I had made for its introduction; I therefore made another, and, introducing a large blow-pipe, threw in air, and observed that the vein, just as it approached the tumor, was considerably dilated, and then opened into it. This likewise was seen by all the physicians and surgeons of the hospital." [1]

Often the violence that causes the rupture is slight and appears inadequate to explain it. Wise [2] relates the case of a man aged forty-eight, who, after a slight fall while walking in a dark night, was attacked on the following day with pain and swelling of the leg, which soon became much enlarged, the tumefaction extending from the knee to the ankle. An incision was followed by a gush of blood, partly coagulated, and a large cavity was found in the calf of the leg. A hospital surgeon was consulted, who, believing that an artery had ruptured, proposed amputation, which was declined. Subsequently the wound was enlarged, when it was ascertained that the extravasation was superficial, being situated beneath the skin. The clots were turned out, and the wound healed by granulation in the course of a month. It was thought that the blood had escaped through a rent in the external saphena vein, near its junction with the popliteal; but whether such a lesion was discovered is not stated.

Emmert, [3] of Berne, in an essay entitled "On Blood-Tumors of the Extremities, Caused by Laceration of the Veins," gives the following case: "A peasant woman, forty-five years old, fell upon her left knee, which soon became con-

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[1] "Of Tumors Formed by Ruptured Veins Sometimes Mistaken for Aneurysms." By Mr. Else, Surgeon to St. Thomas' Hospital. "Medical Observations and Inquiries," vol. iii., p. 169, London, 1769.

[2] "Essay on the Pathology of the Blood," Edinburgh, 1858, p. 366.

[3] *Schmidt's Jahrbücher*, 1843, Bd. 38, S. 328.

siderably swollen, red, and very painful. Spirit lotions were used without effect; the swelling increased, and showed such signs of inflammation, that a physician who was called, suspecting the presence of matter under the skin, made an incision into the tumor on its outer side. Instead of matter, blood, partly fluid and partly coagulated, escaped from the wound. The physician, fearing that the case was one of aneurism, closed the wound, and summoned Emmert in consultation, who found a large swelling of the knee and lower part of the thigh, most marked on the outer side. Just below the joint the tumor was distinctly defined, while above its outline was gradually lost in the œdematous tissues of the thigh. On the anterior part of the knee fluctuation was evident; the patella could be felt by deep palpation, and was in its normal position ; the tumor was tense, the skin covering it being stretched, highly inflamed, and, in some places, already mortified ; the incision was filled with a blood clot, and pulsation could not be discovered. Knee and hip-joints rigid, pain severe, leg normal, general condition feverish. The nature of the swelling seemed doubtful, but as it was imagined to be an extravasation, due to the rupture of a small aneurismal sac, a provisional ligature was placed around the femoral artery before the tumor was laid open, in order to guard against severe hemorrhage, in case this should occur. An incision between seven and eight inches in length was made on the outer side of the swelling, whereupon its entire contents, consisting of two to three pounds of coagulated blood, escaped, or were removed, from the wound. No trace of pus was found, nor did any fresh bleeding take place. After the cavity had been cleaned by the injection of cold water, it was ascertained that the extravasated blood had accumulated between the skin and the muscles. The former was much attenuated, especially at the points where gangrene

had occurred. No proper sac could be discovered. The empty space beneath the skin was extensive, but the source of the bleeding could not be detected, either by the sight or the touch. The femoral and popliteal arteries pulsated strongly, and along the course of the femoral vein could be felt marked varicose swellings. After removing the gangrenous integument, a dressing was applied. The following morning it was discovered that a considerable hemorrhage had taken place in consequence of oozing ; this was arrested by the use of cold compresses. A few weeks later the patient was discharged cured."

Violent muscular contraction sometimes causes the lesion under consideration. Hodgson[1] describes two cases in which a vein in the calf of the leg was ruptured during a severe attack of cramp in the gastrocnemius muscle. A more important case is related by Else[2] : A man, aged twenty-five, was seized with a pain in his leg while lifting a heavy weight. A hæmatoma followed and was opened, discharging a large amount of blood. The case was mistaken for one of aneurism, and the limb was amputated. On dissecting it, the hemorrhage was found to have proceeded from a large vein which was ruptured. The edges of the rupture, which was situated just above a pair of valves, were torn and irregular.

Most surgeons have doubtless met with examples of deep-seated hæmatoma of the leg, occurring in persons whose veins are varicose, and in which the extravasation may be fairly attributed to the accidental rupture of some one of these dilated vessels. Sometimes the accident occurs without any sudden or violent muscular effort. Verneuil,[3] in 1855, refuted the opinion then prevalent, that

[1] "A Treatise on the Diseases of Arteries and Veins," London, 1815, p. 520.

[2] *Op. cit.*, p. 174.

[3] Du siége réel et primitif des varices du membre inférieur.—*Gazette médicale de Paris*, 1855, p. 534.

only the superficial veins were liable to become varicose, and demonstrated the frequent existence of deep-seated varices, both intermuscular and intramuscular, in the lower extremities.   In many cases the lateral dilatations of the walls of the veins were so weak that they burst when even a careful attempt was made to inject them.   The same writer,[1] in 1877, showed that certain cases of that vague affection termed " coup de fouet " were characterized by deep-seated hemorrhagic extravasations, apparently dependent on the rupture of varicose veins, inasmuch as the subjects attacked exhibited well-marked varicosities of the subcutaneous veins.   Several such cases are related in which, from thrombosis or embolism, serious or fatal consequences resulted.

Finally, Legouest[2] has recorded four cases of hæmatoma believed by him to be due to the spontaneous rupture of a vein.   The first one is quoted from Monlinié; the others were observed by himself.

CASE 1.—A man, aged fifty-nine, was admitted into the hospital on account of an enormous swelling of the right leg, the skin of which was tense, shining, and of a dark red color.   The disease had been regarded as erysipelas, with a tendency to gangrene ; but the signs of inflammation were wanting.   Obscure, deep fluctuation suggested the possibility of an abscess, but only blood escaped when the swelling was incised.   Various local remedies were then used without benefit ; the tumefaction increased ; the skin became thinner ; blood, mixed with serum, continued to flow from the incision, and the connective tissue softened and broke down.   Pus was not secreted, but exuberant granulations formed, which were destroyed by the actual cautery.   Under firm compression, the limb gradually regained its natural size and shape.

CASE 2.—This occurred in 1857, in a military hospital in Algiers. A robust fisherman, forty-five years old, was seized with a severe pain in the left leg, shortly after lifting some heavy packages.

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[1] De certaines formes graves du coup de fouet.—*Archives générales de médecine*, 1877, tome i, p. 24.

[2] De la rupture spontanée des veines.—*Archives générales de médecine*, 1867, tome i, p. 513.

The limb was swollen twice its natural size from the knee to the ankle, and was cold, dark-colored, and numb. Voluntary movements were abolished in the affected parts. The patient's general condition resembled that of shock from injury, being marked by great prostration, slow and thready pulse, cold and clammy skin, and involuntary fæcal evacuations. The mind, although sluggish, was clear. Death by exhaustion occurred on the night following admission. Post-mortem examination failed to discover any thing abnormal except in the affected leg, the subcutaneous connective tissue of which, as well as that between the superficial layer of muscles, was uniformly infiltrated with blood. The color of the muscles was darker than natural. There was no evidence of gangrene, nor any circumscribed collection of blood. The deeper arteries and veins were intact and healthy ; the superficial veins were lost in the extravasation and could not be traced.

CASE 3.—A physician, aged forty-nine, during the Italian campaign in 1859, suddenly felt one morning a slight pain in the joint between the second and third phalanges of the right hand, soon followed by a sensation of numbness in the entire finger, which became swollen, tense, and ecchymotic. The patient believed that the trouble had been caused by some violent movement he had made with his hand a few hours previously, while riding an unruly horse. Eight days later he was aroused from sleep by a severe pain in the distal articulation of the same finger, which soon became more deeply discolored by a fresh extravasation, signs of which extended to the back of the hand, which was swollen and stiff. All traces of the disease disappeared a fortnight after its commencement.

CASE 4.—A strong, well-built soldier, aged twenty-two, suddenly experienced a numbness affecting the whole of his right hand, which he remembered to have sprained five months previously. Intense pain followed almost immediately, and, four hours later, the hand was black, and greatly swollen, and had lost sensibility and motion. The symptoms were evidently owing to an extravasation of blood, and subsided in the course of two weeks, leaving the patient entirely well.

I have cited these cases reported by Legouest, because they are offered as examples of spontaneous rupture of veins ; but no such lesion was demonstrated in any one of

them, and its existence in all except the second is at least doubtful. Indeed, in many cases of extensive extravasation, whether due to traumatic or other causes, it is evidently impossible to reach a positive conclusion regarding the source of the hemorrhage, which may have proceeded from arteries, veins, or capillaries. When the extravasated blood is diffused, as is observed in ecchymosis, it disappears almost always by undergoing absorption ; and with rare exceptions, this occurs likewise when the collection is circumscribed. In practice, therefore, the rule is to adopt such simple measures as are calculated to promote this result, avoiding operative interference, unless suppuration takes place, or distension becomes so great as to threaten the occurrence of gangrene. A recent experience, however, has taught me that a ruptured vein may behave like a ruptured artery, causing an affection analogous to that named traumatic false aneurism, and requiring similar treatment for its relief.

On June 10, 1883, I saw at Port Richmond, in consultation with Drs. Walser and Blondel, a gentleman fifty-one years of age, concerning whom I obtained the following history :

On April 9, 1883, while walking in the street, he was suddenly seized with a sharp pain in the left thigh, so severe as to compel him to return home in a carriage. He was visited a few hours later by Dr. Eugene Blondel, and had been confined to his bed ever since. An examination of the limb at that time failed to reveal the cause of the pain, to allay which morphia was administered. On the day following the attack, slight swelling of the thigh was noticed, and, three or four days afterward, marked ecchymosis of the scrotum and upper part of the thigh on its anterior aspect. The further progress of the case up to the time when it came under my observation was marked by continued pain, increasing swelling, and extensive discoloration, involving the greater part of the thigh on the inner side and posteriorly. No positive diagnosis had been made. Toward the end of April he was seen by a consulting physician, who imagined the disease to be scorbutic, and recommended the use of iron. Subsequently,

when the tumor had grown larger, it was suspected to be a trau-
matic aneurism, due to a rupture of the femoral artery. At the
time of my first visit I made a careful examination of the swell-
ing, which occupied the inner and posterior regions of the upper
two thirds of the thigh. The circumference of the affected limb
was six inches greater than that of its fellow. The skin covering
the tumor was stained in various hues by blood which had evi-
dently come from a deep-seated extravasation. Much of the swell-
ing was indurated, but fluctuation was well marked at its lower
and inner part. At first sight it seemed to pulsate. An attentive
examination, however, showed that the pulsation was limited to
the femoral artery. This vessel could be seen and felt beating
from Scarpa's space as far down as the lower end of Hunter's
canal, which had apparently become superficial in consequence
of a displacement of the sartorius muscle, due to the pressure
exerted by the large swelling beneath it. The tension of the
tumor was only moderate, but the patient alleged that at times it
had been very great. I failed to appreciate the importance of
this statement until it was recalled to me by a circumstance pres-
ently to be mentioned. Compression of the tumor was unaccom-
panied with any sensible diminution in its bulk, nor could any
thrill or murmur be detected in any part of it. Heart and arteries
apparently normal. Pulsation of both posterior tibials equally
distinct. Right internal saphena vein varicose.

A careful consideration of the case led me to regard the
swelling as a hæmatoma, caused by the spontaneous rupture
of one of the deeper veins. As the integument seemed to
be thinned at the spot where fluctuation was most distinct,
and as the patient had recently had a chill, followed by
considerable constitutional disturbance, I imagined that
suppuration had taken place, and recommended an explora-
tion of the swelling, with the object of liberating its con-
tents by a free incision, in case this supposition should
prove correct.

June 11th. Patient etherized. Punctured tumor in four places
with a coarse aspirating needle attached to a hypodermic syringe.
No pus was withdrawn, but only old, dark-colored, semi-fluid
blood, which was not putrid. I now decided to avoid laying open

the cavity, if possible, hoping that the sanguineous effusion might yet be removed by absorption.

June 28th. Since last date but little change occurred in the patient's condition until two days ago, when the temperature rose to 103°, and the tumor became softer. Yesterday a red, tender patch, about three inches in diameter, appeared on the right arm, and was regarded as a probable indication of septic poisoning. Again suppuration of the sac was suspected, and preparations were immediately made to empty it by a free incision. But, during the administration of ether, an extraordinary alteration was observed to take place in the tumor, which suddenly grew large, and became exceedingly firm and elastic. I could account for such a change only upon the supposition that the cavity of the tumor was in direct communication with some large blood-vessel. We therefore concluded to postpone operating until the following day, when we might come prepared to deal with what was evidently a formidable blood-tumor. Meanwhile, the patient gave his consent to amputation, in case it should be thought advisable to perform it.

June 29th. Operation. Present: Drs. Walser, Blondel, and Whitman. Digital pressure being made by Dr. Walser upon the femoral vessels in the groin, I incised the swelling, which was found to be filled with blood, mostly coagulated. At first the incision was made only large enough to admit two fingers, with which I broke down the clots, in order to facilitate their expulsion by external pressure. Most of the coagula were soft and dark-colored, but those which escaped last, and which formed a globular mass about the size of a lemon, were light in color, quite firm, and distinctly laminated. When the sac was emptied, the blood which had been collected was found to measure seven pints, and it was estimated that the quantity not measured amounted to one pint. The presence of an open vessel being indicated by a gush of fresh blood immediately following the removal of the last clots, an Esmarch's elastic tourniquet was applied to the upper part of the thigh, and the sac was slit up by extending the incision upward and downward until it measured about nine inches. This allowed a satisfactory inspection of the cavity, at the bottom of which, near the middle of the shaft of the femur, dark-colored blood was seen trickling from a lateral opening in a vein of considerable size, the circulation through which was not completely arrested by the elastic tourniquet. The direction and situation of the vein was that of the

venæ comites of the profunda artery, and the opening into it
readily admitted a large silver probe, which passed both up-
ward and downward an inch without encountering resistance.
Owing to the great depth at which the vessel was placed, and the
plastic infiltration of the surrounding parts, I did not attempt to
isolate it ; but by transfixing, with a somewhat sharp-pointed
aneurism-needle having a very wide curve, the tissues in which the
vein was imbedded, I succeeded, after several trials, in tying it
above and below the opening. The venous bleeding ceased im-
mediately after the ligatures were applied, and did not recur when
the tourniquet was removed. At this moment, however, slight
arterial hemorrhage took place from a small vessel which lay in
the track of the aneurism-needle, at some distance from the vein,
and had doubtless been wounded by it. The vessel was readily
seized with an artery forceps and secured by a ligature, whereupon
all hemorrhage was arrested. Very little blood was lost by the
operation, and it was interesting to observe that when the tourni-
quet was removed, no oozing occurred, the vast cavity being lined
with a layer of fibrin, which contained few or no blood-vessels. No
proper membrane existed to form the sac, which was simply
limited by the connective tissue pushed aside and condensed by
the extravasated blood, and lined in the manner just described.
The operation was completed by stuffing the cavity with iodoform
gauze, and draining it by means of a stout india-rubber tube
passed through a counter-opening opposite the great trochanter.
No sutures were employed.

The case was left in charge of Dr. Walser, who afterward
wrote to me as follows : " There were only four antiseptic
dressings applied. At the end of six weeks there was nothing
left unhealed but a sinus, which eventually discharged a
ligature, and then closed." When I next saw the patient,
four months after the operation, he had quite regained his
health and strength, and weighed one hundred and eighty
pounds. A note from Dr. Blondel, dated October 29,
1884, informs me that he still remains quite well, and is
entirely free from trouble in the affected limb.

In reviewing this singular case, it is first natural to inquire
what may have been the cause of the lesion described. The
absence of cardiac disease, external violence, or unusual

muscular exertion, warrants the suspicion that the coats of the vein were abnormally weak at the seat of rupture. This view is corroborated by the fact that the long saphena vein of the opposite limb was varicose ; for it seems not unreasonable to suppose that a similar condition may have existed in the deeper veins, thereby predisposing them to rupture, either spontaneously, or in consequence of the increased blood-pressure known to be present during ordinary exercise.

In the second place, the case I have related proves that the rupture of a vein may lead to consequences closely resembling those which result from the rupture of an artery when this is followed by what is often called false aneurism. The slight blood-pressure existing in the veins as compared with the arteries, and the tendency of the former to collapse, when divided or empty, are circumstances which usually suffice to determine the closure of an artificial opening and prevent indefinite extravasation. But if the opening is large, and the vein is surrounded by unyielding tissues, the hemorrhage may continue, and cause the formation of a cystic tumor, which communicates directly with the blood-vessel, and which differs from a false aneurism only in the fact that it communicates with a vein instead of an artery. The signs by which such a tumor can be distinguished from an aneurism need not be mentioned here, but it may be interesting to note two points of contrast between it and an ordinary hæmatoma. In the latter affection, in which no permanent communication is established between the blood-cavity and the circulating vessels, the extravasation will attain its maximum at an early period; and no further increase in the size of the swelling will occur, except in the event of suppuration, which can always be demonstrated by an exploratory puncture. If, however, the vessel from which the blood has escaped remains open, fresh hemorrhages will be likely to take place from

time to time, causing a corresponding enlargement of the swelling.

The other point of contrast between such a tumor as I have described and an ordinary hæmatoma, is one which is liable to be overlooked, but which, when verified, is both striking and conclusive. This is the remarkable change that sometimes occurs in the swelling, which suddenly, in the course of a few minutes, may undergo a decided increase in bulk, and become extremely tense and elastic. Such an alteration can be due only to a fresh extravasation, and affords almost positive evidence of the existence of a free communication between an open blood-vessel and the sac. In a doubtful case, therefore, this symptom, which is perhaps pathognomonic, should be carefully watched for, as it occurs only at intervals, and is of brief duration, the extreme distension subsiding either because a part of the extravasation re-enters the vein, or because it undergoes absorption.

Finally, the analogy between a blood-cyst communicating with a ruptured vein and one connected with a ruptured artery extends to the principles of treatment. In the case of rupture of an artery, whether partial or complete, if nature fails to heal the lesion, it is a well-established rule to lay open the blood-cavity, and tie the artery above and below the bleeding point. The case I have recorded proves that, when the open vessel is a vein, a resort to the ligature may be equally successful; and perhaps future experience will show that it is equally imperative.

METALLOSCOPY AND METALLOTHERAPY.

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BY metallotherapy is meant the rational treatment by metals, externally applied or internally administered, of nervous and other disorders wherein sensibility and motility are markedly disturbed.

To Dr. V. Burq, of Paris, belongs the honor of originating this new therapy; hence the name Burquism under which it is now generally designated.

We think it well to mention at the outset one of the points most strenuously insisted on by Dr. Burq, namely: the therapeutic susceptibility of the individual, in illustration of which we will instance anæmia. In one this will be found amenable to iron, in another to copper, to gold, etc.; the curative agent varying with the individual's metallic susceptibility, whereby we prescribe; and not by label, as is too often done with syphilis and mercury, chlorosis and iron, skin diseases and arsenic.

Metalloscopy is the process whereby the metallic sensibility is determined. But prior to giving its rules it will be in place first to consider the doctrine of Burquism, which, in *verba magistri*, is as follows:

Neuroses may be divided into two great classes:

1. Those where in there is constantly a loss, total or partial, of general or special sensibility and muscular force.

2. Those wherein neither is affected, as in epilepsy.

The neuroses of the first class, especially hysteria, may show themselves under so many fleeting forms and varied aspects that to aim at describing them would be about as quixotic as to try to set down all the shrill and discordant sounds of a violin with three strings, whereof one would represent sensibility, another motility, and the third the intellectual status.

And yet however great their number and variety, all the symptoms of neuroses of sensibility and motility—I omit designedly those affecting the intelligence—may be classified under the three following groups, namely:

1. Group of hyponervous symptoms, which may be designated by the sign *minus* (—), under which we include all negative or *minus* disorders.

a. Of general sensibility : *analgesia and anæsthesia.*

b. Of special sensibility : *amblyopia, achromatopsia, anosmia, acousia,* etc.

c. Of the genital sense : *impotence, sterility,* etc.

d. Of motility : *amyosthenia, paresis, paralysis,* etc.

e. Of the vaso-motors : *athermia, ischæmia of the capillaries, dysmenorrhœa, amenorrhœa,* etc.

2. Group of hypernervous symptoms, to which may be given the sign *plus* (+), under which we include all positive or *plus* disorders of the above-mentioned functions.

f. Neuralgias, visceralgias, cutaneous and *sensorial hyperæsthesias* of every description.

g. Clonic and tonic spasms, which manifest themselves in the solid muscles by cramps, eclamptic or hysteric attacks, and contractures (club-foot, torticollis, strabismus, vaginismus etc.) ; and in the hollow muscles by palpitations, coughs, (*toux férine*), asthma, incoercible vomiting, etc.

h. Elevation of temperature, even to the extent of simulating fevers of different types.

i. Various abnormal hypersecretions: *lachrymation, ptyalism, polyuria, hyperidrosis, leucorrhœa*, etc.

3. Group of ponderating symptoms—by and by we shall see why this sign is expressed by that of *equality* ($=$).

j. Various gastric disorders: *anorexia, dyspepsia*, and *gastralgia*, with their train of secondary symptoms, such as impoverishment of the blood in all its constituents, loss of flesh, flaccidity of tissue, puffiness, fluor albus, etc.; in a word, the cachexia inherent to the condition which constitutes chlorosis, chloro-anæmia, *pâles couleurs*, etc. of systematic writers.

The distinguishing traits of these three groups are as follows:

Those of group No. 1 (—) are permanent; they are the silent attendants of the neurosis in all its phases; they progress or retrograde, *pari passu*, with it; they are always the first to disappear or return again; absent only as long as the cure persists, their return unfailingly heralds an impending relapse; they keep, so to speak, step together; in fact, they are the neurosis' constant index, its pulse, and it is in this direction that it behooves the physician to be constantly on the alert.

On this account, says Dr. Burq, I never go without two instruments, the dynamometer and æsthesiometer.

The symptoms of the $+$ group are as noisy as those of its opposite (—) are silent, for which reason they have ever enjoyed the baneful privilege of engrossing the attention of the profession as well as that of the laity. They are essentially transitory and constantly merge into one another, giving rise to the belief in a cure which does not exist.

When one of this group ($+$) remains unchanged for years (as in a case before us), it is exceptional; yet even then it coexists with other troubles which are intermittent. As I happen to mention this word, let me put you on your guard

against it in neurology, and do not connect it with quinine as its antagonist. In this regard I could relate many a curious tale, how bottle upon bottle of the antiperiodic had been emptied in its name; about as fruitlessly and as often as has been done with iron in chlorosis, in conformity to the ancient theory of its reconstituent effect upon the red globule, an error against which I never omit entering a protest whenever opportunity occurs.

The disorders of group No. 3 (=) progress on parallel lines with those of the two other groups, and like group No. 1 are permanent. I call them ponderating because their action is to measure out the forces needed in striking them at the root—namely, in the stomach, which, as has been very truly said, "holds the keys to the house" (*tient les clefs de la maison*). For if this organ ceases to properly perform its functions there results an alteration in the production of nerve force.

All the neuroses of the first class (with anæsthesia and amyosthenia), whatever their apparent seat or the name they go by, constitute but one and the same affection, and require the same treatment.

For in all these neuroses it is constantly the same immediate, efficient cause—namely, a diminution in the normal expenditure of nerve force resulting from functional inadequacy of the skin and muscles, these two great waste producers of the economy. In every instance the result is necessarily the same: on the one side a proportionate artificial expenditure, most frequently intermittent, of the non-utilized force at any point of the organism, or maybe at several points simultaneously (+ or hypernervous symptoms); and on the other, gastric disturbances, to cut off the production supply. All such cases require alike for their cure previous and complete removal of all hyponervous disorders.

Proportionately as sensibility and motility become again

normal, and thereby equalize physiological gain and waste, spasm in its turn (which has been wrongly defined " a contraction without purpose or reason "), neuralgia or delirium, which act as safety valves, gradually diminish; dyspepsia or gastralgia, its cause removed, stops in its work of dismantling the organism, and presently the patient finds in his food and a more perfect digestion all the elements required by the organism, viz.: iron, as well as albumen, fibrin, etc.

Hence this double conclusion :

" Anæsthesia and amyosthenia and all such disturbances are the proximate cause of all the disorders, and constitute, metaphorically speaking, a touchstone of the evil to surely indicate what is its best remedy.

" Given a nervous affection, with disturbed sensibility and motility, the entire problem consists in finding an agent, whatever it be, which will restore them both to a normal condition."

BASES OF BURQUISM.

Passing on to the question of practice, I will say, certain metals, those which nature supplies in most abundance, but in the native state, or one as near as possible thereto, iron first, next copper, then zinc, gold far ahead of silver, tin, platinum, aluminium, and some more, arsenic, mercury, manganese, and may be antimony, nickel, and many besides, which metallotherapy has not as yet been able to utilize, in virtue of a special action on the nervous system, be it dynamic, electric, or any thing else, it matters little, but which probably is exerted under conditions of particular affinity between these metals and different organisms, have the following peculiar property, namely : When applied to an anæsthetic surface, or over amyosthenic muscles, they generally produce a return of sensibility and muscular force in the parts covered by the metal first and next in their

vicinity, and also increase the temperature and capillary circulation, at the same time producing subjective phenomena of heat, formication, etc., in the member under experiment ; then, after a lapse of time proportionate to the extent of surface covered, as well as to the subject's nervosity, phenomena of an inverse order occur, *i. e.*, anæsthesia, and amyosthenia, now called post-metallic, accompanied by a sense of fatigue in the limb under experiment, but which may extend to the brain itself.

Any metal acting in the aforesaid manner, is the one characteristic of the patient's metallic or therapeutic sensibility ; and this metal, and it alone, applied not to the seat of disorder, but to the anæsthetic or amyosthenic parts, or internally administered in proper form, will soon produce in a permanent manner what it did but transitorily at first in the metalloscopic examination, and ultimately will cure, or, at the very least, notably improve the neurosis, acting at every point in a manner to confirm the doctrine I have just laid before you.   To condense the entire question we will put it thus : Given a nervous affection with anæsthesia and amyosthenia, find a metal which will restore one or both.   Such is the problem to be solved, and the solution will indicate the means of cure.

To illustrate, let us suppose a series of three neurotics with anæsthesia and amyosthenia.   In No. 1 we find sensibility and muscular force increased by external application of iron ; in No. 2, by copper ; and in No. 3, by zinc.   To the first we would administer iron, to the second copper, and zinc to the third, feeling sure of a favorable result in each case, *i. e.*, restoration of all functions in abeyance to a normal condition.

METALLOSCOPY.—For this examination, which may be performed by cutaneous application of discs or subcutaneous injection of very weak solutions of the oxides, four instruments are required, viz. :

Æsthesiometer,

Dynamometer,

Thermometer,

Sphygmograph.

We will not speak of the last instrument, as it is an unusual one and somewhat difficult of manipulation. Besides it could do no more than confirm the information given by the thermometer, dynamometer, and æsthesiometer.

The thermometer is of the spiroid surface kind, surrounded by an ivory wall, and covered in so as to make it almost a closed cavity. It is held in position by an elastic band with buckle. Between the mercury and ivory is placed a ring of the metal we wish to try. It is well to have two thermometers, one for each side, and apply them simultaneously.

The dynamometer is a hand one, with self-registering index. It is used to ascertain the grip or strength of the muscles of each forearm, which may be assumed to represent that of the entire muscular system under ordinary circumstances.

The æsthesiometer resembles a compass with blunt points, and has a cross-bar to indicate the distance between its points. At its extremities are two concealed needles which may be used to test sensibility to pain. They are made to protrude in the same way as the lead in a metallic pencil, by screw action.

In order to clearly indicate the procedure at every step, we will suppose we have to deal with a typical case, presenting the usual symptoms of hemianæsthenia and amyosthenia, which we always look for in the upper extremities, as this is their seat of predeliction. Our first step would be to ascertain the extent of the former, accurately with the æsthesiometer, or more roughly by transfixing the skin

with a needle, noting at the same time if blood follows the pricks. The second we determine with the dynamometer. We next proceed to take the temperature of each fore-arm; and when found, say in 10–20 min., we slip under the thermometer on the affected side the metal we wish to try. Now, if it produce, after from 1–15 minutes, certain phenomena, such as increase of temperature and muscular force, abolition of anæsthesia, bleeding of the formerly exsanguined needle-pricks, with heat, tingling, burning, numbness, and heaviness of limb experimented on, together with local redness and sweating of parts covered by the metal, we may safely conclude we are in possession of the active metal, and proceed at once to give it internally.

Such are the phenomena produced by the metal suited to the patient's idiosyncrasy; all others, except in a few rare instances, produce no effect whatever.

If we keep on with the application of the metal in the above instance, after a lapse of time of variable duration, another set of symptoms occur of an inverse order, called post-metallic. Anæsthesia is the first to return, then amyosthenia; the needle-prods cease to bleed, and the temperature falls.

If, however, we stop at the point where sensibility is at its highest, as well as muscular strength and temperature, the improvement remains and very often extends to the whole body, to gradually disappear in a day or two.

We will merely mention that in some cases we get a transfer—that is, the hemianæsthetic side gains by application of appropriate metal exactly and symmetrically what the other side loses.

Taking, for instance, a right hemianæsthesia susceptible to gold: If we apply three or four five-dollar gold pieces to the right forearm, we shall find, as sensibility returns, that it is disappearing at identical points on the opposite side,

until ultimately the right side becomes of normal sensibility, and the left anæsthetic.

This transfer holds good for special senses too, as, for example, in acousia and dyschromatopsia the ear or eye affected gains evenly what is lost in the other.

Metalloscopy also furnishes us with the means of knowing if our patient is cured. Thus, supposing the treatment to have been carried out for four or six weeks and all the functions appear to be again in a normal condition and we want to be sure of it. For this purpose we apply several discs of the metal we had found in our first metalloscopic examination, to the formerly anæsthetic side. If the cure is complete, the result will be negative; if only apparent, there will be a return of all the old symptoms in inverse order.

Occasionally we meet with what is termed a hidden or latent metallic aptitude—that is, anæsthesia and amyosthenia exist, but are uninfluenced by any metal externally applied,—and this sometimes happens in those whose metallic aptitude is already known. In this latter case, all we need do is to give internally the active metal; in a few days its external application will again bring about the usual results. If, however, we are ignorant of our patient's idiosyncrasy, it will tax our ingenuity to discover it; unless we find by inquiry there is a susceptibility to mesmerism or somnambulism which always indicate copper. We may also gain some hints by inquiring what metals patient has ever taken, and if amongst them there has been one which increased appetite, etc., we may administer it and try external application in a few days to confirm our suspicion.

There are a few practical points it may be well to mention for those who have not the necessary instruments or time to go through a metalloscopic examination *en règle*. Taking cutaneous sensibility for our guide: For iron, all we need is

a needle and a piece of steel, such as a steel thimble, a blade of knife, etc. ; for copper, a piece of brass, such as bell brass ; for gold and silver, pieces of coin, and so on with all the metals, excepting aluminium and platinum, which can only be had of the instrument-maker.

An examination of this kind requires only from one to five minutes, and the needle-pricks will indicate with sufficient accuracy the cutaneous sensibility.

Metals in a pure state are generally inactive and not unfrequently altogether inert. Experience has shown the following combinations to be the most active :

1. Iron combined with carbon, or steel.
2. Copper, alloyed to 8 to 10 % with zinc.
3. Gold, coin standard.
4. Zinc, alloyed to 5 to 6 % with tin.
5. Silver, coin standard.
6. Tin, alloyed to 3 to 4 % with regulus.
7. Platinum, pure.
8. Aluminium, pure.

The above is also the order of their utility, according to Dr. Burq.

TWO CASES OF HEMORRHAGE INTO THE SPINAL CANAL, ONE ACCOMPANIED BY FRACTURE OF THE PELVIS, THE OTHER BY IMPACTION OF THE BODIES OF THE DORSO-LUMBAR VERTEBRÆ; BOTH TENDING TO RECOVERY.

By J. S. WIGHT, M.D.,

PROFESSOR OF OPERATIVE AND CLINICAL SURGERY AT THE LONG ISLAND COLLEGE HOSPITAL.

Case 1.—L. W., a seaman, twenty-six years of age, fell from the rigging of a ship to the deck, on the 14th of February, 1884, striking on his left side, and was taken care of by the captain till the ship arrived in port, on the 22d of February, when he was admitted to the Long Island College Hospital, where I examined him the day of his admission, and found the following signs and symptoms: The patient was lying quite helpless in bed. His face wore an anxious expression. He had some slight contusions on the left side of his head, and appeared to have had some concussion of the brain, the effects of which had mainly passed away. There had been a very severe and extensive contusion of the soft parts from the crest of the left ilium to the trochanteric region, as shown by marked extravasation of blood; and the signs of this extravasation continued for several weeks. I made a thorough examination as to fracture of the thigh-bones; neither the shafts nor the necks of these bones were broken. There was no apparent deformity about the pelvis. I put one hand on the right ilium, and the other hand on the left, and made considerable pressure, when the patient cried out with pain; and as I repeated the pressure, I thought I could detect mobility of the parts. So far as I could form an opinion, there had been a fracture of the pelvis through the horizontal and descending rami of the pubes, and there had been some separation of the left sacro-iliac synchondrosis.

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The motion and sensation of the lower limbs had been disordered. The voluntary motion of the left lower limb had been quite completely abolished, and the left great toe dropped down just as if there had been total loss of power in the extensor pollicis, and some contracture of the flexor pollicis. The patient had some power of voluntary motion in the right lower limb. He could draw it up and rotate it to some extent, yet the disability was considerable. The sensation in the right lower limb was quite abolished. The prick of a pin below the knee made no impression. No reflex in the right lower limb could be detected. The sensation in the left lower limb was exaggerated. The slightest touch not only caused pain, but produced painful contractions of the muscles which had been deprived of voluntary control. The small vessels on the left side were dilated, especially in the foot and the lower part of the leg, and this condition led subsequently to considerable swelling. The temperature, as tested by surface thermometers, on the right ankle was 84 degrees, on left ankle was 88 degrees. There was not only vaso-motor paralysis, but there was augmented oxygenization in the fluids and tissues of the affected parts on the left side.

And now we must make our diagnosis include more than has been already expressed : either the sacrum must have been fractured or there must have been some hemorrhage into its central cavity, in order to produce the phenomena we have just described, for I suppose we may dismiss concussion of the spine as an adequate cause in this case. The central portions of the motor nerves on the left side have lost their power, while the central parts of the sensory nerves on the same side are in a state of irritation. On the other hand, the central parts of the sensory nerves on the right side have lost their power, while the central parts of motor nerves of the same side are perhaps somewhat irritated. The vaso-motor nerves on the left side have lost their power, while on the right side they are so far irritated as to produce some spasm of the small blood-vessels.

At the time of examination of this case—and with a section of the medical class present—I argued in the following way : There is in this case a fracture of the pelvis, and perhaps a fracture of the sacrum, and doubtless there is hemorrhage in the sacral canal. But in order to interpret the phenomena of disordered sensation and voluntary motion, as well as

involuntary motion, we may, with much reason, suppose that, as the patient came down, he struck on his pelvis first, having his spine bent in the dorso-lumbar region, and that this part of the spine was wrenched and sprained so as to lacerate the blood-vessels at that point, and that there was hemorrhage into the spinal canal, on the left side of the lower extremity of the spinal cord, as it were—an apoplexy, but, to speak more correctly, a compression of the spinal cord due to hemorrhage. Now this blood-clot interferes with the power of the cells on the left side of the cord—and the motion of the left lower limb is abolished, and the sensation of the right lower limb is also abolished, for the nerve-cells and the nerve-fibres of voluntary motion are on the same side. And this same blood-clot interferes indirectly with the power of the cells of the right side of the cord, and this interference is in the form of an irritation, that is most decided among the cells of sensation on the right side of the cord, the effect being most manifest in the hyperæsthesia of the left lower limb. And in the next place there is a mild irritation in the cord that eventuates in contraction of the small blood-vessels of the right lower limb, so that less blood flows in the ankle and foot, and so that the local temperature is diminished. And finally, there is compression in the cord that eventuates in dilatation of the small blood-vessels of the left lower limb, so that more blood flows in the ankle and foot, and so that the temperature is augmented.

And now, if all this I have said with some detail is correct, this patient has some chances of improvement as time goes on ; and if he recovers, may we not infer that our estimate of his case is substantially true? And to aid in his recovery we must adopt a judicious plan of treatment. In the first place he is helpless, and he must not only have a good bed, but he must be carefully turned from one side

to the other, to prevent too long pressure on dependent parts. His ankles must be supported by cotton-wool, to keep the heels from too long contact with the bed. We will give him every morning a teaspoonful of Rochelle salts in a glass of water; this will have a beneficial effect on both the bowels and the kidneys. He may take twenty drops of the muriated tincture of iron three times a day in water. Let him have a plenty of milk, and a moderate quantity of solid food. Keep him on a wire bed, and see to it that he is always clean and comfortable.

This patient was despondent and complaining from time to time, having fears that he would not recover. About the 1st of May he had so far improved as to be able to sit up some; and after a few days—about the middle of May—his left foot was considerably swollen. A bandage improved the swelling. The last week of the month the toe-drop began to get better. All this time the left foot was painful. My patient watched all night with another patient the 2d of June. He had been using crutches for several days. His improvement continued, and he was able to be in the open air much of the time. On June 22d he tried to walk without his crutches, but his thigh pained him so much that he failed. On June 26th he was so much better that he was sent home to England by steamer. He has further improved since he has been at home.

CASE 2.—J. D., a carpenter, twenty-six years of age, April 17, 1884, fell from a sky-light a distance of fifteen feet, and, standing upright, struck on the bottoms of both feet, and then *went into a heap*, when he was unable to get up. He was conveyed to the Long Island College Hospital by the ambulance on the same day, where, on making an examination, I found the following signs and symptoms : There was a projection of moderate size in the dorso-lumbar region, as if the bodies of the last dorsal and first lumbar vertebræ occupied less vertical space than normal. After careful examination of the lower limbs, I found no fracture or dislocation. The patient could move his lower limbs to some extent.

He had more power over his thighs than his legs, and more power over his legs than his feet. So much for voluntary motion. There was some paralysis of the small blood-vessels of the legs and feet that caused moderate swelling, and this effect appeared to be about the same on both sides. In some respects there was total loss of sensation in the following regions: On the outside and bottom of the feet, as well as on the heels and some parts of the backs of the feet; on the outer and posterior aspects of the legs; on the posterior surfaces of the thighs; on the entire gluteal regions of both sides; on the penis, scrotum, and perineum; and on the recto-coccygeal surface. In any part of this territory a pin could be thrust to any depth without the least sign of pain. I repeated this experiment over and over again in the presence of the medical class, and always with the same result—no sensation. The territory in which sensation was lost appeared to be very nearly the territory of distribution of the cutaneous portion of the *sacral plexus.* But as soon as the pin-punctures came near the territory of the distribution of the cutaneous portion of the lumbar plexus, the patient began to cry out with pain, and when the pin-punctures got over into this territory, they seemed to show that there was an exaggerated sense of pain, as if the cutaneous ends of the nerves of the lumbar plexus were more excitable than normal. The rectum had not only lost its power to feel, but it had lost its power to move; the reflex function of the rectum had been abolished. The bladder had lost its contractile power, eventuating in retention and overflow of urine. This patient's injuries had been accompanied by very severe shock.

In the presence of the medical class I endeavored to interpret these phenomena, so interesting and so instructive, and I reasoned in the following manner: This patient came down on his feet. The superincumbent weight of his body bent the dorso-lumbar spine. The bodies of the last dorsal and the first lumbar vertebræ occupied less vertical space than before the fall. The cancellous bone was compacted —crushed. The ligaments of the posterior part of the spine were strained. The blood-vessels were pulled upon and some of them were lacerated, and so there was hemorrhage behind the spinal cord. The blood pressed on the posterior surface of that part of the cord that gives origin to the sac-

ral plexus, and hence there is total obliteration of sensation in the territory of its distribution. And there is impairment of motion in that territory, because the anterior roots have not received so much damage as the posterior roots. And then it appears, that the cells in the vicinity, where the lumbar plexus begins, are in a state of irritation. They exaggerate the impressions made on the ends of their nerve-fibres. The conclusion then is, that there is a fracture of the dorso-lumbar spine—accompanied by hemorrhage into the spinal canal. I have seen several fractures of the spine caused by forcible bending of the body forward, and they have generally resulted in death. A case of this kind came under my care some years ago : A man in a small boat was run over by a tug. The man jumped into the water, and the tug struck him on the back of the head and the neck and came against the shoulders, and doubled him up, and broke his dorso-lumbar spine, and after a few weeks he died, when the bodies of two vertebræ were found compacted— say, crushed. Now this patient, that died, had a greater injury than the one that is at present before us. In a word, the prognosis is—uncertain. We cannot always be sure of the result in an injury to the spine. Yet sometimes we say that death will be inevitable. In the present case I am led to believe that there may be some improvement as time goes on ; yet we must not be too confident and make promises that cannot be fulfilled. We doctors do not know every thing. If we keep our eyes open and our wits about us we may climb to a higher level in the future.

I may now add the following particulars of the clinical history of this case :

The water had to be drawn by catheter once or twice a day till the 27th of April, when the patient could pass his water without aid, though he could not then completely empty his bladder. About this time he could move his lower limbs better than he

could when he was first injured.   On the 30th of April the end
of his penis began to become gangrenous.   On the 1st of May
there was incontinence of urine, as if the bladder had filled up and
was running over.   On the 2d of May bed-sores were observed
on the right gluteal region and on the right trochanteric region,
having a tendency to spread.   About the 8th of May the condition
of the penis was improving. And soon after the legs were stronger.
On the 20th of May some sensation had returned to both legs.
During all this time it was necessary to evacuate the rectum with
an enema—which was accomplished by a long, flexible tube, in-
troduced with great care.   May 24th this patient was discharged
from the hospital improved.   His friends took him away—and I
have not been able to find out how the case has been progressing
since that time.

A CASE OF TRAUMATIC APHASIA.*

B. BRIBACH, M.D.,

ST. LOUIS, MO.

THE following case presents the interesting features of aphasia produced by pressure from the fractured skull, with entire absence of paralysis; of its complete relief by trephining, and of the fact that the seat of the injury did not exactly correspond with the location of the centre of speech.

Wilhelmina Müller, a healthy, stout country girl, eight years of age, had her skull fractured on the morning of June 28th, by the kick of a mule. She had walked some distance after recovering from a stupor of a few minutes' duration, and I saw her about an hour after the accident happened. She was in a badly frightened and excited condition, but entirely conscious, and walked freely about my office. The fracture was situated in the left temporal region, rather more than two inches long, one sixth of its extent involving the frontal, the rest the parietal bone. It had the shape of a curve, convex above, as represented in the diagram; the bone below and all along the line was markedly depressed. There was considerable difficulty in disengaging the flap of the cut scalp from between the fractured edges, into which it was firmly wedged, and I did so after giving chloroform. As there were no symptoms of either concussion or compression of the brain evident, I closed the wound by sutures.

After the child had recovered from the effects of the anæsthetic, it was found that she lacked the faculty of speech. I ascertained

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* Dr. Bribach published the substance of this case in the St. Louis *Courier of Medicine* for September, 1884, but the case seem so valuable as to deserve re-writing and illustrating. It may thus secure the full measure of notice it deserves at the hands of neurologists and surgeons.—EDITOR.

that she had not spoken any thing since receiving the injury. A close examination showed absence of paralysis of the muscles of the face, tongue, palate, and limbs. The facial expression was intelligent, and the girl showed evident anxiety to speak, finally making known by signs that she wanted water. Continued efforts to make her speak proved useless, and I directed the father to take her home and keep her quiet, and to induce her to communicate her wants by means of a slate and pencil.

On June 29th, twenty-four hours after the accident had occurred, I found the child doing well, excepting the existence of aphasia. Pulse 90, full and moderately strong ; temperature normal ; appetite and secretions good. She had uttered only one word, " coffee," which she had made use of to indicate any of her wants. She had not made use of the slate, but whether from coexisting agraphia, or from lack of training to express her thoughts by means of writing, I was unable to ascertain. No symptoms of paralysis were discoverable anywhere. Patient efforts to make her speak were without result, and I inferred that I had to deal with a case of aphasia produced by pressure on the speech centre. The parents consented to the operation of trephining, which I deemed necessary to relieve the condition and to meet complications by subsequent inflammation. Dr. A. Montgomery, of St. Louis County, who kindly assisted me, concurred in my view of the case, and of the necessity of relieving the compression of the brain.

I trephined the same afternoon, thirty hours after the child was injured, and elevated the entire depressed portion of the skull. The dura mater was not injured, and the inner table of the skull was free from spicula.

June 30th.—Patient had passed a quiet night, and taken a hearty breakfast. Pulse and temperature normal. The mother informed me that the girl had slept over eight hours after the operation, and on awaking asked for a drink. In the morning she had again correctly named and asked for some playthings. During my presence the child could not be induced to speak.

July 1st.—I learned that patient had repeatedly spoken, but seemed to have been confused ; she would often call things by wrong names. On removing the dressing, she complained that I hurt her ; on this occasion I heard her speak for the first time.

The patient lived four miles from my place, I could see her but once a day, and had no opportunity to closely watch the manner in which the faculty of speech returned, For four or five days

there was a certain amount of loss of verbal memory ; the speech was rather slow, the articulation perfect, but substitution of wrong names occurred frequently. At the end of ten days, about July 8th, she spoke about as well as before.

Surgically, the case progressed very favorably. There was no fever at any time ; I allowed the girl to get up at the end of the second week, the scalp-wound being then nearly closed. In the first and second weeks in August, two small splinters of bone were discharged from the wound over the seat of the trephined opening, and I subsequently removed one more, after which the wound
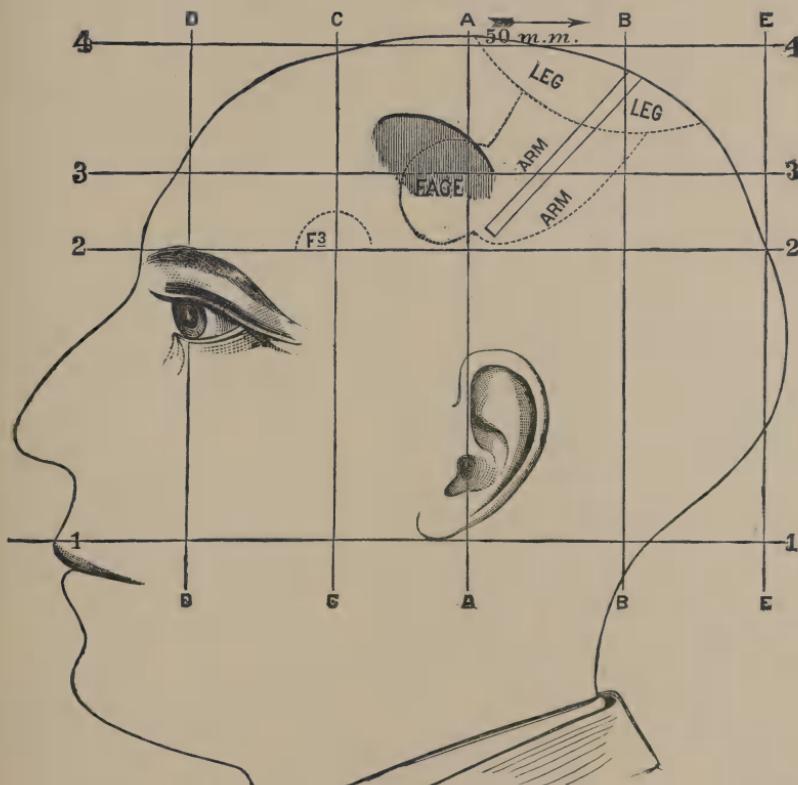
I. LINES OF CRANIO-CEREBRAL TOPOGRAPHY PROJECTED ON A PROFILE OF THE HEAD.—1–1. Alveolo-condyloid plane (horizontal); 2–2, Fronto-lambdoid line ; 4–4, Vertex horizontal. A–A, Auriculo-bregmatic line passing through meatus auditorius, and drawn at right angles to line 1–1; at the top of the skull this line indicates the true bregma. B–B, vertical drawn parallel to A–A, 50 mm. (2 inches) posterior to it ; at its point of impact on the top of the skull this line crosses the posterior end of the fissure of Rolando, the so-called *Rolandic point*. The straight double line extending obliquely from the *Rolandic point* over-lies the course of the fissure of Rolando, and is known as the *Rolandic line*. The areas marked off by dotted lines overlie the centres for the leg, arm, face, and for speech (motor function). THE HEAVY CON-CAVE LINE WITH SHADING IMPINGING ON THE FACE CENTRE INDICATES THE SITE AND RELATIVE EXTENT OF THE CRANIAL FRACTURE AND DEPRESSION.

closed entirely.   It is now covered by a thick cicatrix, the girl has attended school since the beginning of September, and is now as well as ever.

Comparing the seat of the injury with an adult skull, I concluded that the pressure of the fracture had been bearing on the third and ascending frontal and the ascending parietal convolution of the left hemisphere.   Subsequent reference to Dr. Seguin's diagrams of cranio-cerebral topography, and exact measurements of the patient's head, showed that in this I was mistaken.   The measurements of the child's head are eleven and a half inches from root of nose to occipital protuberance, twelve inches from right to left external meatus auditorius.   A line drawn from the true bregma to a point midway between the external angle of the left orbit and the left meatus auditorious crosses the centre of the fracture three and one quarter inches distant from the bregma. Projections on Dr. Seguin's diagrams place the depressed area on the lower part of the ascending frontal, and but slightly on the posterior part of the third frontal, convolution, involving the face centre according to Dr. Seguin, the centre of articulation according to Ferrier.   Assuming the relative locations of skull and brain to be identical with the patient and Dr. Seguin's diagrams, I can explain the involvement of the speech centre in this case only by assuming that the inferior depressed portion of the fracture exercised some indirect pressure on the speech centre, which is located anterior to the fracture.

ON A PECULIAR RINGED AFFECTION OF THE PREPUCE AND GLANS.*

By R. W. TAYLOR, M.D.,

SURGEON TO CHARITY HOSPITAL, N. Y.

THE three cases which follow illustrate a peculiar and interesting affection which has not heretofore been described.

CASE I.—In January, 1874, an eminent practitioner of New York consulted me regarding an affection of the penis which caused him much uneasiness of mind. He was a large, portly man, thirty-eight years of age, having enjoyed perfect health, with the exception of occasional attacks of migraine. His family medical history was excellent, and he himself had led a prudent life. Some few weeks before he consulted me he felt slight pricking and even painful sensations in the penis toward the glans. As he walked, the movement of the organ or the pressure of the clothes caused slight uneasiness. Very soon he noticed certain peculiar scaling rings on the prepuce and glans, near the insertion of the frænum. When he came to me, the following appearances were noted : On retraction of the prepuce, chiefly on the left but also on the right side, there were in all about six scaling rings. These efflorescences were of a diameter of from one quarter to one third of an inch, and were very slightly reddened, covered with a thin, quite adherent layer of epidermis, and in width were about one third of one line. The redness, slight as it was, was sharply limited to the morbid circle, and the enclosed mucous membrane was apparently normal. If any of these rings were pinched between the fingers, no thickening was appreciable, nor did they in any way seem to cause any

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* Read before the American Dermatological Association, Aug. 29, 1884.

interference in the mobility of the parts.   From a careful study I was convinced that the lesion consisted in hyperæmia and slight increase in the epithelial layers of the parts.   The patient had consulted Drs. Van Buren and Weir, who had not at that time seen a similar case.   His chief anxiety consisted in a fear that the affection was a commencing epithelioma.   Though seemingly insignificant and superficial, these lesions were very persistent, and only disappeared after an existence of several months under an arsenical treatment.   The patient took Fowler's solution in small doses, and it was only when fifteen drops thrice daily were taken that full involution of the rings occurred.   As they disappeared, the itching, pricking, and painful sensations gradually subsided.

Besides this peculiar eruption on the penis, a few months later the patient had three papules on the right foot, which appeared to be those of lichen planus.   The number of papules was increased by the appearance of several on the dorsal aspect of the foot, but they did not disappear under the use of arsenic as did the rings on the penis.   In September, 1875, these rings returned, and this time they looked shiny and micaceous.   At the same time patient had the same painful sensations as in the former attack, and he felt spots on the penis, which presented no abnormal appearances, yet which were hyperæsthetic even upon light pressure. Besides these morbid phenomena, the patient suffered from an uneasy sensation about the right hip, upon the skin of which he had fugitive sensations, such as accompany goose-flesh.   This attack lasted about two months, and left the patient well, except that he had the hyperæsthetic condition of penis upon movement or pressure.   Early in January, 1876, the patient suffered from a relapse of his scaling affection of the penis, and at the same time he had several papules bearing the appearance of lichen planus. He underwent further treatment, was cured, and until to-day had not had a relapse, but the slight hyperæsthesia of penis is felt from time to time.

Case 2.—A gentleman, an American, of full habit, thirty years of age, having had gonorrhœa two years previously, which had been complicated by right orchi-epididymitis, consulted me in July, 1878, for an affection of the prepuce and glans.   He was a man free from any diathesis, and of healthy parentage.   His orchi-epididymitis, which had been treated by me, was followed by more or less severe paroxysmal attacks of hyperæsthesia and neuralgia of the right side of the scrotum and corresponding

crural surface, with occasional fugitive neuralgic pains in the hip of the same side. Under internal and external remedies the induration in the epididymis was much resolved, and the painful sensations were nearly wholly relieved. Still any fatigue, exposure to cold, or excess in eating and drinking was almost certainly followed by an exacerbation of this trouble. Otherwise he had noticed nothing abnormal until May of 1878, two months previous to his visit to me in July of same year. He then began to experience a sensation of slight heat and itching in the prepuce and glans, which caused him to pull and press the end of the penis for relief. Occasionally this patient, as did the first, experienced a sensation as though a pin was pricking his prepuce. In the latter part of June, while on his return from the Continent, he found upon the prepuce, the fossa glandis, and on the posterior portion of the glans, several rings, which he said increased in number very' rapidly until he came to me. I found about eight fully formed rings and a number of incomplete ones. On the right side of the prepuce a ring one half inch in diameter enclosed another of about half the size. These rings were similar to those of the first case, slightly elevated, though not perceptibly thickened. When examined by oblique light they were seen to be distinctly but slightly elevated. They were not very markedly hyperæmic, nor was there much hyperæmia at their margins. The scales covering them were of a dull gray color and quite adherent, but were thrown off in small quantities every day. This patient was also treated with arsenic, and at the end of a month, when he was taking ten drops of Fowler's solution thrice daily, these lesions disappeared. He had a similar relapse in 1879, and for more than a year experienced the peculiar neurotic sensations already spoken of.

CASE 3.—A gentleman, thirty-six years of age, thin but wiry, of nervous temperament, given to high living, consulted me January 27, 1884. He had enjoyed excellent health through life, but had suffered from gonorrhœa in 1874. In 1880 he had several chancroids, which had been very actively, even severely, cauterized by a country physician. Having a long, tight prepuce, he after this suffered from repeated attacks of balanitis. In July, 1883, he noticed a number of small rings on the glans and prepuce ; these were chiefly annoying by reason of the burning and pricking sensations which accompanied them. They disappeared under external treatment, and returned again in December of that year. When I saw him first in January, 1884, he had four typical rings such as were described in the first case. Under arsenic he was

cured in four weeks. Locally he used simply a thin layer of absorbent cotton.

The clinical features of this interesting affection are, then, slightly elevated very narrow rings of reddened mucous membrane, with very well-marked but thin layer of epithelial scales superimposed. There was no areola; in fact the limitation of the morbid process was very sharp, the enclosed area of tissue being normal. In general, rings of from one quarter to one third of an inch were seen, but occasionally they had a diameter of half an inch. Segments of circles more or less complete were seen. The affection was preceded and accompanied in all instances by unpleasant painful sensations, which in one instance were very severe, and even persisted on the site of the lesion after their disappearance. No scar or loss of tissue was observed after their involution.

It would seem that the rings remain stationary for several weeks, and that these were liable to be followed by new ones, in all cases the prodromal nervous sensations being felt.

As to etiology, I am disposed to regard the cause as of neurotic origin. In the first case, though the patient suffered from migraine, there was no local cause discoverable; still the painful symptoms were very marked, and at one time were accompanied by painful sensations in the hip of the corresponding side. Of the two other cases, one patient suffered from orchi-epididymitis, and the other from balanitis and tenderness of the prepuce, due to severe cauterization. Instances are not infrequent, though, in which reflex pain about the scrotum and inguinal region are due to this affection of the testicle. Then, again, it is well known that relapsing herpes progenitalis has often followed severe cauterization in subjects previously free from that affection. Whether these

analogical facts will help us in explaining the origin of the affection in the two last cases I am unable to say, still it is within the bounds of credence that the affection was in them due to reflex irritation. As to diagnosis, little need be said. The affection is so clearly marked in its appearance and history that it can be readily diagnosticated. It may be well to add that the ringed form of the erythematous syphilide, the same form of the papular syphilide, psoriasis in rings, tinea tonsurans (J. C. White), lupus erythematosus, may be found on the glans and prepuce.

The treatment found most efficacious by me was Fowler's solution of arsenic, pushed even to the extent of fifteen drops thrice daily.

EDITORIAL DEPARTMENT.

THE COAGULATION OF THE BLOOD.

By FREDERICK P. HENRY, M.D., PHILADELPHIA.

THE coagulation of the blood, although invariably treated of in physiological text-books, is in no sense of the term a physiological process, being a product of abnormal conditions. The blood circulating in the living, healthy vessels, never coagulates, but no sooner is the vessel-wall injured, however slightly, by a needle puncture or an escharotic, than a thrombus begins to form at the site of injury. This local coagulation may be regarded as a conservative effort to repair the lesion, but, if so, the remedy is frequently worse than the disease, for the thrombus may be swept away by the blood-current, and if finally arrested in a terminal artery—such, for example, as the arteria centralis retinæ—may work irreparable mischief. The coagulation of albuminous fluids, whether it take place within or without a cell-body, is a necrosis, the importance of which in pathological processes is just beginning to be recognized, and the time is probably not far distant when the recently introduced term, *coagulation necrosis*, will be considered tautological. Hayem speaks of the coagulation of the blood as a kind of rigor mortis—*une espèce de rigidité cadavérique,*—and this manner of regarding it is justified not only by the change in its physical properties, but also by the fact that coagulation never occurs without the destruction of some of the morphological elements of the blood. Nevertheless, the act of coagulation furnishes most important data for the study of the physiology of the blood, for it is a spontaneous analysis, the thoroughness of which de-

pends upon the slowness with which it takes place. For this reason, horses' blood, which coagulates very slowly, is much employed in physiological researches. In such blood, before the clot has begun to form, the red corpuscles have gravitated to the bottom of the vessel, while the white remain at the top and form the buffy coat, and it has always been a matter of observation that, in such blood, the clot becomes gradually firmer as its upper layers are approached ; and, further, that a relation exists between the density and color of coagula. In the upper layers, where the color is lightest, the density is greatest, and *vice versa.* In other words, coagulation is most perfect where the white corpuscles are most abundant.

It would serve no practical purpose to give a history of the rise and progress of the various theories that have been upheld with regard to the coagulation of the blood, and their subsequent decline and fall ; but no paper on the subject can be regarded as complete, that does not contain some reference to the experiments made by Dr. Andrew Buchanan, of Glasgow, in 1831. This observer found that certain animal fluids, such as lymph—liquor pericardii—and non-inflammatory effusions, such as the fluids of hydrocele, hydrothorax, and ascites, which do not coagulate spontaneously, may be made to coagulate by the addition of the fluid obtained by squeezing a blood-clot in a linen cloth. He subsequently found, that the most effective method of causing the above-named liquids to coagulate was by adding to them what he called *washed blood-clot.* This he made by mixing blood with from six to ten parts of water and stirring for five minutes. The mixture was allowed to stand for from twelve to twenty-four hours, and then filtered through a coarse linen cloth ; the residue left upon the filter was then washed with water. This substance, mixed with a little spirit of wine to prevent putrefaction, retained its coagulative power for many months. This washed clot is a mixture of fibrin and white corpuscles, the red corpuscles having been dissolved in water and removed by filtration, and the question that presented itself to the mind of Buchanan was : Upon which of these ingredients does this coagulative power depend ?

He concluded that it was due to the white corpuscles, from the facts, that the upper layers of a clot, in which these bodies are most numerous, possessed a much greater coagulative power than portions taken from the lower layers, and that this coagulative property was unusually powerful in the buffy coat of horses' blood, which is almost entirely composed of white corpuscles. From these researches Buchanan concluded that fibrin exists in solution in serous fluids and in the liquor sanguinis, and that it has no spontaneous tendency to coagulate, but does so when brought in contact with a substance derived from the white corpuscles, which substance he considered to be of the nature of a ferment, for he compared its action to that of rennet upon milk.

These facts attracted little attention, and were almost entirely forgotten when Prof. A. Schmidt, of Dorpat, re-discovered them in 1861. He endeavored to isolate from blood the substance on which its coagulative power depends, and believed that he had identified it with serum-globulin, which he accordingly called the fibrinoplastic substance. He precipitated serum-globulin from serum by diluting it with water and passing through it a stream of CO_2, and demonstrated that serum from which the so-called fibrinoplastic substance had been thus precipitated had lost its coagulative power. Schmidt considers that there is little or no serum-globulin in the circulating blood, but that it is the product of the white corpuscles, which, according to him, undergo rapid destruction when the blood is withdrawn from the vessels. He found that plasma, from which the white corpuscles had been separated by filtration, was very poor in serum-globulin; while the white corpuscles remaining on the filter yielded a large percentage of this substance.

He next endeavored to ascertain upon what the coagulating property of transudates depends, and identified it with a substance belonging also to the class of globulins, to which he gave the name of fibrinogen. Transudates from which this substance had been precipitated no longer coagulated on the addition of the fibrinoplastic substance, and, on the other hand, when these two substances were isolated and mingled in alkaline solution con-

taining a certain proportion of salts, the result was the formation of fibrin. Coagulation, Schmidt then supposed, was due to the interaction of these two bodies in saline solutions. He subsequently ascertained that the two bodies may be present in a fluid —that of hydrocele, for instance, which may contain considerable quantities of serum-globulin—without coagulating, but that a clot will form on the addition of blood or blood serum. It then appeared evident that a third factor was necessary to the act of coagulation, and this he named fibrin ferment. He obtained this substance from blood, or, preferably, serum, by mixing it with twenty times its volume of alcohol, and setting it aside for a considerable period of time—two weeks to three months. The alcohol coagulates all the proteids of the serum, which are collected on a filter, dried and pulverized, and the powder dissolved in water. Such a solution, when added to a mixture of fibrinogen and fibrinoplastin, that does not coagulate spontaneously, will often cause the prompt formation of a clot. Schmidt derives the ferment, as well as the serum-globulin (fibrinoplastin), from the white corpuscles; for he found that plasma, from which these bodies had been separated by filtration, when subjected to the process for obtaining ferment, yielded a very inactive solution of this substance, and that blood received directly from a vessel into absolute alcohol—by which means the destruction of the white corpuscles is supposed to be prevented—yielded no ferment whatever. He also demonstrated, by actual counts of the white corpuscles, that a large number of these bodies disappear in the act of coagulation, presumably partly in the formation of fibrin ferment. He counted the leucocytes in the plasma of horses' blood, and found that they numbered 14,909 per cubic millimetre in an average of eleven counts; he then allowed the plasma to coagulate and counted the leucocytes of the serum, and found that they numbered, in an average of nine counts, but 4,222 per cubic millimetre, 71.7 per cent. having disappeared in the coagulum. He also counted the red corpuscles before and after its defibrination, and found the difference to be only thirty per cent. He therefore argues that the disappearance of the leucocytes is not a mechanical entanglement

in the meshes of the fibrin, for, were this the case, there would be no such difference in the percentage of disappearance between the red and white corpuscles. Besides, on examining a clot with the microscope, the red corpuscles may be seen entangled in the meshes of the fibrin, while of the white, not a trace remains but a few greatly altered cells, the majority having entirely disappeared in the formation of the clot.

Schmidt's theory of coagulation, therefore, is that it is due to the union of two substances, fibrinogen and serum-globulin, under the influence of a ferment, and that the fibrinogen exists as such in the circulating blood, while the serum-globulin and ferment are formed after the blood is withdrawn from the vessels.

The researches of Hammarsten tend to prove that serum-globulin is an unnecessary factor in the formation of fibrin, which, according to him, is derived solely from fibrinogen under the influence of the ferment. He has prepared fibrinogen free from all traces of serum-globulin, and has caused the formation of a clot by the addition of the ferment only. He admits that coagulation may be produced by the addition of serum-globulin to a transudation that will not coagulate in the presence of the ferment alone, but he has shown that other substances, such as calcium chloride and casein, have the same effect. He has also shown that, from fluids which do not coagulate on the addition of ferment, fibrinogen may be obtained which does coagulate when the ferment is added. In such a case the fluid evidently contained substances that prevent coagulation. Such substances are free alkalies, alkaline carbonates, and certain salts. For example, in a hydrocele fluid containing very little fibrinogen, that does not coagulate on the addition of the ferment and does coagulate on the further addition of calcium chloride, it is possible that this salt may decompose an alkaline carbonate that held the fibrin in solution. He claims also that when coagulation is produced by adding serum-globulin to a non-coagulating mixture of fibrinogen and ferment, the effect is due to impurities mingled with the serum-globulin, for when he repeated the same experiment with pure serum-globulin, coagulation did not take place.

Hammarsten, therefore, attributes the formation of fibrin to one substance, fibrinogen, which exists as such in the blood, under the influence of a ferment derived from the white blood corpuscles

The above-named observers agree in regarding fibrin as a precipitate caused by the union of soluble substances in the liquor sanguinis.

Later observations by Wooldridge, Norris, Hayem, and Bizzozero attribute the formation of fibrin, in great part, to a direct transformation of morphological elements of the blood.

In the Proceedings of the Royal Society for June 18, 1881, is an important contribution to the subject by Mr. L. C. Wooldridge. He obtained leucocytes from lymphatic glands, by a process described in his paper, and washed them thoroughly with a half-percent. solution of common salt, after which he found that their normal microscopic appearance was unaltered. He then found that if to one volume of suspended cells an equal volume of ten-percent. solution of common salt were added, the whole was immediately converted into a " peculiar semi-transparent jelly " which behaved chemically precisely like fibrin, while, under the microscope, he found that the cells, as such, had entirely disappeared. " Only nuclei imbedded in a distinctly fibrous ground-substance " were visible. Similar results were obtained on adding distilled water or a solution of magnesium sulphate. He then studied the behavior of leucocytes toward plasma. The most convenient way of obtaining plasma is by injecting peptone into the blood of an animal. If the animal be bled a few minutes after the injection, the blood does not coagulate, and by means of the centrifugal machine the corpuscles may be entirely separated from the plasma. Wooldridge obtained a specimen of this peptone plasma which presented the following characters :

It was totally uncoagulable : 1. On dilution with water. 2. On passing a current of CO_2 through it. 3. On addition of Schmidt's fibrin ferment. 4. On addition of serum-globulin. 5. On addition of normal serum. 6. On standing till it was foul.

Nevertheless, on adding leucocytes to such plasma, coagulation promptly followed, of which the completeness was in direct ratio

to the number of leucocytes added. As additional facts in favor of his view that the plasma changes the leucocytes directly into fibrin, he gives :

1. The weight of the coagulum is, as near as may be, in such observations, identical with that of the cells that have been added.

2. The percentage of albumins in peptone plasma before coagulation is identical with the percentage after coagulation with cells.

3. The protoplasm of the cells has completely disappeared and has been converted into a partly fibrous, partly granular, ground-substance ; the nuclei remain.

4. If to a very large quantity of suspended cells (say 50 cubic centims.) a very small quantity (1 cubic centim.) of peptone plasma be added, the whole clots firmly.

Wooldridge does not deny that Hammarsten's theory of coagulation is partly true, for he concludes his paper with the statement that there are "two essential processes in the coagulation of the blood, one of which has been hitherto entirely wrongly appreciated or overlooked." This latter process is that the "dead" plasma converts the white corpuscles directly into fibrin. At the same time, however, that this occurs, a substance is liberated from the cells which converts the fibrinogen also into fibrin. This is the other process. The substance which is liberated from the cells is fibrin ferment.

Later observations by Norris, Hayem, and Bizzozero associate the formation of fibrin with changes in certain morphological elements of the blood : by the first, to changes in what he terms the invisible corpuscle or advanced lymph disc ; by the two latter, to similar changes in bodies termed by Hayem *hæmatoblasts*, from their supposed share in the formation of the red corpuscle, by Bizzozero, *Blutplättchen.* At the present time, the subject has assumed such a controversial aspect that it is somewhat difficult to arrive at an exact understanding of it. Thus Norris claims that the blood-plates [1] are nothing but products of disintegration

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[1] This term is used for both the "hæmatoblasts" of Hayem and the "blut-plättchen of Bizzozero, which are identical.

of his colorless corpuscle, while Hayem and Bizzozero maintain that the corpuscle of Norris is nothing but a red corpuscle decolorized by manipulation. Certain it is, however, that the blood-plates may be seen in the circulating blood. These bodies (as shown by Osler) are the component constituents of Schultze's granule masses seen in blood by all microscopists. They are the elementary corpuscles of Zimmermann, the *globulins* of Donné, the *grains sarcodiques* of Vulpian, and the *granulations libres* of Ranvier. The latter regarded them as particles of fibrin which serve as centres of coagulation, just as a crystal of sodium sulphate, dropped into a solution of the same, will serve as a centre of crystallization.

If a cover glass be firmly fastened to a slide with parafine, as directed by Hayem, and blood dropped at its edge, it will run beneath by capillarity, and in the islets free from red corpuscles may be readily seen, with a power of from 400 to 500 diams., the bodies described as blood-plates. They are exceedingly delicate, colorless bodies, with a diameter from two to three times less than that of the red corpuscles, and, according to Hayem, exist in the blood in health, to the number of 255,000 per cubic millimetre. They are scarcely under observation than they begin to alter in shape in a variety of ways, but in each instance a division of the blood-plate into two portions may be detected—namely, the one central, vitreous-like, and strongly refractive ; the other peripheral, granular, and of a gray color. The latter is extremely viscous, and causes the formation of groups of blood-plates, from the borders of which may be seen to proceed a number of exceedingly fine filaments that cross each other in every direction, thus forming an irregular network. These changes are exactly coincident with the formation of a coagulum, and the agents which prevent these alterations in the blood-plates are precisely the ones that prevent the formation of fibrin. Among these may be mentioned a temperature of $0°$ C., certain saline solutions, liquor amnii, and dropsical effusions.

Hayem does not absolutely claim that fibrin is derived directly from his " hæmatoblasts, " for, in referring to the viscous matter

that exudes from them, he propounds, and does not answer, the question whether it is actually fibrin or a substance that combines to form fibrin with some other substance held in solution by the plasma.[1]   He holds that a fibrinous reticulum may exist without having the "hæmatoblasts" as points of departure, but maintains that fibrin is never formed without the participation of a substance derived from these very vulnerable elements.   The views of Bizzozero are almost identical with those of Hayem, but, in addition, he has demonstrated that the blood-plates are the chief agents concerned in thrombus formation.   He also concedes that the white corpuscles may be concerned in fibrin formation.[2]

The foregoing pages contain a *résumé* of our knowledge concerning the coagulation of the blood, and although the subject is still surrounded with some obscurity, it is manifest that there are excellent grounds for regarding fibrin as a metamorphosis of certain formed elements of the blood—namely, the white corpuscles and the blood-plates.   The question whether the blood-plates are disintegration products of young red corpuscles, as claimed by Norris, is an entirely separate one.

In the opinion of the writer, a blood-clot is the result of two distinct processes : coagulation proper, and fibrin formation ; the one chemical, the other morphological.   Coagulation occurs in milk under the influence of a ferment (rennet), but there is no fibrin formation.   The same process takes place in blood under the influence of a ferment derived from the white corpuscles and perhaps also from the blood-plates, while, at the same time, and IN ADDITION, there is formed a fibrinous reticulum which is a direct metamorphosis of the same elements.

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[1] " Est-ce déjà de la fibrine ou bien une matière en voie de transformation et se combinant avec une autre substance dissoute dans le plasma ?"—*Arch. de Phys. Norm. et Path.*, tome v., 1878.

[2] "Die übrigen Versuche sprachen zwar viel mehr für die coagulative Rolle der Blutplättchen, als für die der weissen Blutkörperchen, machten aber letztere noch nicht in so hohem Maasse unwahrscheinlich und liessen namentlich die Betheiligung beider Elemente noch mehr order weniger denkbar," Ueber einen neuen Formbestandtheil des Blutes und dessen Rolle bei der Thrombose und der Blutgerinnung.—Untersuchungen von Prof. Dr. Julius Bizzozero, *Virchow's Archiv*, Bd. 90, p. 323.

NEW BOOKS AND INSTRUMENTS.

The Elements of Physiological and Pathological Chemistry. A hand-book for medical students and practitioners. By T. Cranstoun Charles, M.D., Lecturer on Practical Physiology, St. Thomas' Hospital, etc. Philadelphia: Henry C. Lea's Son & Co., 1884.

This excellent hand-book, though written by an English physiologist, seems to have made its first appearance under the auspices of American publishers—as there is no evidence that it is a reprint of an English publication. The precise scope of the book may be perhaps best understood by comparing it with the physiological chemistry of Gamgee, of which the first volume—equal in size to the entire treatise of Dr. Charles—appeared in 1880. The aim of both authors is to present to their readers, not merely a summary of facts and opinions in the important sciences of physiological and pathological chemistry, but to exercise them in methods of personal investigation. The very attempt to do this testifies to the progress which has been made in the exact study of the changes which take place in the living body. This progress tends to render physiological chemistry as " practical " an interest with the physician as are the " dismal " anatomical sciences whose material is only obtainable through death.

Dr. Charles' manual divides the subject under four main heads : Nutrition and Foods ; Digestion and the Secretions Concerned ; The Chemistry of the Tissues, Organs, and Remaining Secretions ; The Excreta, the Fæces, and Urine.

Gamgee's first volume is devoted to the chemical composition of, and the chemical processes relating to, the elementary tissues of the body, including the blood, lymph, and chyle ; while the chemistry of the chief animal functions is reserved for the second volume. The chemical changes involved in the activity

of the nerve and muscle tissues are discussed with them, so the functions treated of apart must be those of digestion, nutrition, and excretion, which occupy as large a portion of Charles' manual. In this, the description of the chemistry of nutrition is preceded by chapters giving minute directions concerning the apparatus and methods employed in solving the problems proposed. Then the intimate nature of nutrition is described, and brief statements given of its relations to the evolution of force—*i. e.*, heat and kinetic energy. After a classification of foods and the quotation of several well-known analytical tables of their ultimate constituents, the different classes of food are described in detail,—the alcohols and fatty acids, the carbohydrates and especially glycogen and grape sugar, the fats and the albuminoids. Methods of examination for grape sugar are described in the first book, and also to some extent in the fourth, in the chapter on diabetic urine. Similarly, methods for the investigation of the albumens are described with great fulness in the first book, together with their derivatives, leucin and tyrosin, and tests for the amyloid degeneration ; while, in connection with the practical rules, the theories of the functions of proteids are succinctly summarized. Then the examination of albuminous urine and the pathology of albuminuria are taken up in the fourth section.

An interesting chapter on ferments, fermentation, and putrefaction, opens, somewhat unexpectedly, the section on digestion. The chemisty of the tissues to which the third book is devoted, is largely occupied with the blood, its gases, hæmoglobins, corpuscles, coagulation, chemical analysis and separation of its different constituents, and finally its pathology. The study of muscle is not nearly so extensive, it takes up but a single chapter, thus contrasting with the learned dissertation on the contractile tissues, which is a conspicuous feature of Gamgee's treatise. But the latter includes elaborate discussion on the physiology of muscular contraction, which is only briefly touched upon by Dr. Charles.

The chapters on the nerve tissues and on respiration are chiefly of theoretical interest : while, conversely, the practical and minute rules given for investigation of the excreta cannot fail to be useful to the physician. This chapter includes careful descriptions of biliary and urinary calculi ; and terminates with an admirable syllabus of a short practical course in physiological chemistry, such as really should be traversed by every student in medicine. In this course the student first examines a few hydrocarbons—starch, dextrine, glycogen, and grape sugar,—then passes to nitroge-

nous bodies, prepares and tests albumen, separates albumen from its solutions, prepares acid and alkali albuminates, fibrino-plastin, fibrinogen, syntonin, leucin, and tyrosin ; among the digestive juices, studies the saliva, gastric juice, pancreatic juice, and bile. The rules for the study of blood and muscle are much less numerous ; the first referring only to the corpuscles and coloring principle, the second to muscle extractive. The rules for the examination of urine are, however, complete.

Dr. Charles' manual admirably fulfils its intention of giving his readers on the one hand a summary, comprehensive but remarkably compact, of the mass of facts in the sciences which have become indispensable to the physician, and, on the other hand, of a sys-tem of practical directions, so minute that analyses often consid-ered formidable may be pursued by any intelligent person who takes the necessary time and procures the necessary apparatus.

[M. P. J.]

A Practical Treatise on Fractures and Dislocation.—By Frank Hastings Hamilton, A.B., A.M., M.D., LL.D., late Professor of Surgery in Bellevue Hospital Medical College, etc., etc. Seventh American edition, revised and improved. Illus-trated with 379 wood-cuts. 8vo, pp. 1005. Philadelphia : Henry C. Lea's Son & Co., 1884.

For twenty-five years this classical work has held first rank among practical treatises in medicine, and each edition has kept pace with the times. As our readers are already familiar with the work, we will confine ourselves to a reference to a few of the points which mark the present edition.

Dr. Hamilton has seen fit to retain in the present edition the chapter, entire, on " General Prognosis," as it first appeared in the edition of 1880. The greater part of this chapter is devoted to the discussion of Dr. Sayre's " Report on Fractures," made to the American Medical Association in 1874, which argued that, with extension and counter-extension made in the proper direc-tion, the perfectly normal condition of the bone as to length and position could be obtained, and so held until consolidation. This doctrine of practice was seen at once to be dangerous, because, on insufficient grounds, it ran contrary to the experience of the profession. It is here shown that Dr. Sayre's conclusions were founded on imperfectly recorded cases, and that he made no use of personal observation. We are led by the Report to believe that it was written in advocacy of plaster-of-Paris—not of the

truth. It will hardly be necessary to cumber future editions of this book with this argument.

In the case of ruptured arteries in compound fractures objection is made to the recent proposition of Poinsot, to ligate the main arterial trunk which supplies the injured limb, or to compress the point of lesion and the main artery at the same time, because such procedure "would render the occurrence of gangrene almost inevitable," and "expose the life of the patient to greater danger than to amputate the limb."

The author's further experience adds testimony to the incompetency of Listerism to do all that its extreme advocates claim for it. In the treatment of compound fractures he gives carbolic acid the rôle of a mild stimulant, advocates cleanliness, makes it essential to avoid rudeness and officiousness, recommends the use of the drainage-tube when necessary. He says : "I do not believe—indeed, from actual experience I know—that the knee-joint cannot be 'freely laid open' under the Lister treatment 'with the certainty that no danger will follow.'"

The "popular error in reference to refracture" at any period after four or six weeks, thereby to "materially add to the length of the limb," is referred to.

In fracture of the ossa nasi Dr. Mason's dressing by means of a transverse pin with a strip of rubber is given with an illustrative drawing.

In the discussion of the causes of Colles' fracture Dr. Hamilton reviews the opinions and repeats the experiments of Bouchet, Lecomte, and others, which, in the sixth edition, he by mistake attributes to Dr. Pilcher as original. He asserts that he is "far from being convinced that this classical fracture, occasioned by a fall upon the hand, is due exclusively to the action of the ligaments." The results of his experiments are summarized at length, but the observation is well made that the facts adduced are those in "dead-house experiments," and, on that account, were not subject to the same conditions which are present in the living subject. This fracture in the living subject is the "result of concussion, avulsion, and muscular action combined." Here we recall the preface to the work, where the author very aptly fixes the degree of importance which, in the study of fractures and of dislocations, attaches itself to experiments on the cadaver, to clinical observations alone, and to cabinet specimens unattended by their clinical history.

Considerable space is devoted to the treatment of fractures of

the patella. As might have been expected, the full faith in the Lister method, which swept clean, invited the boldest interference with the knee-joint in cases of fracture of the patella. Whether by wire, by silk, or by bone, the securing of the fragments of the patella in position, even with the Lister system, is shown by the testimony of Chauvel, Le Fort, Kocher, and others, to be attended by "tedious recovery, anchylosis, amputation, or death." And, for such reasons, the author condemns "washing of the joint," opening the joint to evacuate blood, and aspiration.

In the chapter on "Gunshot Fractures," we meet the familiar pictures, to show the injury which the rib and the vertebræ sustained in the case of President Garfield. The accompanying text gives briefly the clinical history and the results of the post-mortem examination.

The book has but few defects. We would prefer an arrangement in such books as are used for ready reference, as well as for study, whereby the multitude of references and opinions might be more readily distinguished from the more practical conclusions of the author and directions in practice.   [J. V. D.]

A Manual of Obstetrics. By EDWARD L. PARTRIDGE, M.D. Wm. Wood & Co., 1884. 16mo, pp. 295.

This little book is a very good sample of its class. In these days, when even Scott's novels are issued in abbreviated editions, what wonder that a great subject like obstetrics should be summed up in about four hours' reading? The general arrangement of the volume follows the accepted text-books, and shows throughout that condensation of these has been done by one who is both a practical obstetrician and a class-room teacher. The best portion of the book strikes us as being the account of labor and its management, while the least satisfactory is the sketchy anatomical portion.

To the wider question of the real value of such a booklet, we must say we cannot rate it highly.

So long as our present system of medical education continues, when a student can pass an examination in obstetrics without ever having seen a case, such books as this will be in demand. They are useful to the student to cram upon, but for purposes of true and working knowledge they are not worth much. Such knowledge can only be acquired by seeing actual cases, supplemented by a larger and more philosophical treatment of the subject than the dimensions of this book allow. If these little manuals and remembrancers are of value in medicine, it is chiefly in those

branches, like anatomy, where they serve to recall definite facts, and not in an eminently physiological branch like obstetrics.

The sixty illustrations, of which the title-page proudly tells us, are quite remarkable for their badness, truly a " making of darkness visible."   [w. m. t.]

Diseases of the Rectum and Anus. By Charles B. Kelsey, M.D., Surgeon to St. Paul's Infirmary for Diseases of the Rectum, Consulting Surgeon for Diseases of the Rectum to the Harlem Hospital and Dispensary for Women and Children, etc. Pp. 416. Wm. Wood & Co.

The arrangement of the book is excellent.   An introductory chapter devoted to anatomy and physiology is presented, without which any book on a special subject would be incomplete.   It includes an excellent *résumé* of the subject-literature, particular attention being paid to the discussion and expulsion from belief of the existence of the third sphincter, on which so much has been written. A very complete chapter is devoted to malformations of the rectum and anus, in which imperforate anus is especially considered, with excellent illustrations borrowed from Mollière.

The primary operation at the perinèum for imperforate anus is deprecated and preference shown for inguinal colotomy either alone or with an accompanying operation for the formation of an anus.   The author shows a tendency to commend the inguinal incision in preference to the lumbar for cases of intestinal obstruction in general ; the opening of the peritoneal cavity not being fraught with the degree of danger in times past supposed. Our own experience leads us to consider it an operation easier of performance than the lumbar incision, and one that results in much less annoyance to the patient as long as he may live, but in point of safety the two operations cannot be compared.

In the examination of a patient with disease of the rectum the author recommends certain gynæcological chairs. We have found Sargent's lounge and table superior to any chair yet invented. Its perfectly flat surface for use in the dorsal decubitus and its lateral inclination when the patient is in Sims' position render it especially useful in this class of diseases.

We appreciate the sense of the arrangement in sequence of abscess and fistula when we consider the etiology of the latter. In fact, the general arrangement of the book is excellent, and it covers a wider range of subjects than any book that we have heretofore seen.

The subject of fistula has not, we think, been given all the atten-

tion it deserves, and the same may be said of the chapter on hemorrhoids. Mr. Allingham, in his most excellent work, devotes one fourth of the book space to hemorrhoids, and an equally searching study is made of fistula. It adds greatly to the completeness of a book to enter elaborately into the study of the rarer forms of disease affecting a certain region, and Dr. Kelsey's work covers a wider range of subjects than any other book with which we are familiar, but for all readers of a work on diseases of the rectum, specialists as well as general practitioners, too much cannot be written on these two subjects. There is a tendency among the laity to consult charlatans and irregular specialists when afflicted with either of these diseases, and it is the duty of the physician to wrest these cases from them. It devolves especially upon the general practitioner to do this, and for his instruction particularly should a lengthy discussion of this subject be made.

More attention is given to rectal hernia than in any other textbook on this subject. There are no published accounts of any cases having occurred in this country, but the condition is interesting as a surgical curiosity at least.

The arrangement of the latter part of the book, which treats of new growths and rectal stricture, is excellent. The division of neoplasms, ulcers, and stricture into those that are malignant and those that are non-malignant, is proper and practical ; method and arrangement in classification by authors are greatly appreciated by the book reader, and, especially, by the searcher after individual subjects.

Dr. Kelsey is a warm advocate of the operation of external proctotomy as a substitute for colotomy in stricture of the rectum, and in that preference he is up to the times. We have noticed, especially in Europe, the growing abhorrence of colotomy and the increasing favor of external proctotomy in suitable cases, and they include a large proportion of those for which colotomy is generally performed. Excision of the rectum in proper cases, for cancer, is advocated by the author in preference to lumbar colotomy, and in his belief he is in accord with modern thought, especially among German surgeons, with Volkmann at their head. It has often occurred to us that the great sacrifice of life whic his sometimes made by our Continental neighbors in the development of a new operation cannot be accused of being *nil* in its results. Their experience and conclusions only serve to place the procedure on its proper footing and permit us to profit by them.

We do not object, however, to the school for experimentation being located abroad. [**F. C. F.**]

Beitrag zur Kentniss der Menstrualen Psychosen.

By ELLEN F. POWERS, Zürich. 1883. [A Contribution to our Knowledge of Menstrual Psychoses.]

This excellent essay, which forms the thesis presented by its author to the faculty of the University of Zürich, treats of a form of insanity which, notwithstanding its practical and theoretical importance, has been somewhat neglected by alienists. This is probably due to the inherent insufficiency of a classification of insanity which is based upon purely symptomatic data. In accordance with this system most writers have been satisfied to group the various forms of insanity and psychic disturbance recurring in connection with the menses under the head of periodic and circular insanity. These forms, as a class, have been well studied, and whatever has been affirmed of the whole group is affirmed of the psychoses included under that group ; so that without much especial study of menstrual insanity, it has been assumed that since this is typically periodical in its manifestations, it shares with other periodical insanities their almost hopeless prognosis.

In one of the most important monographs upon this subject, that of v. Krafft-Ebing (Archiv für Psychiatrie, Bd. viii., p. 65, 1878), the eminent author reports nineteen cases observed by himself, and expresses the view that these menstrual psychoses are most typical forms of periodical insanity. The same author considers this as belonging to the group of degenerative insanity, of which the prognosis is eminently unsatisfactory. He believes, however, to have found in potassium bromide " the only remedy which can favorably influence the bad prognosis of the disease."

In the essay before us Dr. Powers has made an analytical study of nine cases of menstrual insanity which have come under her own observation. Of each of these we have excellent histories, especially admirable in their fulness as to points in their heredity, as well as in the completeness of the physical examination of each patient. There are frequent notes of the behavior of the patients during the time they were under observation (chiefly in the insane asylum at Zürich), together with the treatment pursued in each individual case. In addition to these nine cases of her own, the author has also collected sixty-eight cases from literature, old and recent. Many of these are necessarily incom-

plete, but in general furnish a rich store of material, upon which the author has based certain conclusions as to ætiology, diagnosis, and, above all, prognosis and treatment.

Dr. Powers "believes that periodic menstrual insanity cannot be properly classified as readily as would at first appear ; for although it has many resemblances to the periodical and cyclical psychoses, such as the typical recurrence of similar attacks at regular intervals, the neurotic disposition and behavior of the patients during intermissions, and the abrupt onset of the attacks," it differs from these forms of insanity :

1st. In possessing a much more favorable prognosis.

2d. In the well-known ætiology of each individual attack.

3d. In the fact, which v. Krafft-Ebing also observed, that the consciousness of the patient is not as much affected in menstrual insanity as in the periodical and circular psychoses.

4th. In that, menstrual insanity is typically a " reflex psychosis."

As is well known, menstrual insanity manifests itself in a variety of forms ; no two cases are exactly alike ; they vary in severity as well as in character. In one patient we may have only slight and scarcely observable mental aberration at the time of the menses, while in another the insanity will manifest itself in a violent form of acute mania. The cases studied in the work of Dr. Powers are divided by the writer into the following groups :

A. Characteristic, well-marked cases of menstrual insanity.

    a. mania ; *b*. melancholia ; *c*. other acute forms.

B. Abortive cases of menstrual insanity.

C. Transition forms between periodic menstrual mania and mania simplex.

D. Characteristic, well-marked cases of circular menstrual insanity (mania at time of menses, with intervals of melancholia).

E. Transition forms of circular menstrual insanity combined with sexual perversion.

F. Stuporous insanity, cataleptic menstrual insanity, and insanity which takes the form of pathological drowsiness.

G. Hysterical attacks in connection with the menses.

H. Dipsomania menstrualis periodica.

I. Kleptomania menstrualis periodica.

All of these varieties are well-marked forms of insanity, with the exception of group *G*. The case coming under the group is one of hysteria pure and simple, with a menstrual ætiology for each of the hysterical attacks.

As to "differential diagnosis between other psychoses and

periodic menstrual insanity, this depends upon the menstrual ætiology of every attack in the latter affection. In the typical cases, at least, it is positive that the same nervous irritation which causes the menstruation also gives rise to the attack. This irritation is probably that of ovulation. It starts from the periphery— that is to say, in the ovarian nerves, and passes through the ordinary reflex channels to the central nervous system, upon which it produces an intense impression. That this takes place, to a certain extent even in the normal state, is shown by the manifold physiological and pathological changes which occur in the disposition and character, as well as the vaso-motor functions of normally healthy women at the time of menstruation. Periodic menstrual insanity, therefore, is only the exaggerated result of this normal irritation."

Dr. Powers' experience, as well as that of v. Krafft-Ebing, is that most patients affected by this disease " have a neuropathic constitution, and are of an hereditary neurotic dispositon. To this rule, however, there are exceptions, some of our patients presenting nothing abnormal, and possessing a good hereditary history." " In this connection we must not forget that even among psychically healthy people the percentage of those whose hereditary history shows a neurotic taint is in all probability relatively larger than one would suppose."

" v. Krafft-Ebing has called attention to the ordinary neurotic initial symptoms of menstrual insanity : there are headache, rush of blood to the head, increased or diminished frequency with irregularity of pulse, dizziness," etc. * * * " Ordinarily the attack is preceded by sleeplessness and irritability " ; all of these symptoms may be wanting, however, and then the attack begins suddenly. " The termination of an individual attack may be either sudden or gradual ; in every case the attacks resemble each other in general character."

An important point in the differential diagnosis between periodic menstrual insanity and an ordinary attack of mania, is the nature of the post-paroxysmal symptoms. In menstrual insanity the attack is followed by great mental and physical weakness and exhaustion, while ordinary mania gradually merges into a condition of great irritability, with a tendency to violent outbursts of temper, followed later on by the well-known post-maniacal, stuporous, or melancholic stage of the attack ; the general physical condition of these patients is good.

In every case of periodic menstrual insanity we should be able to ascertain :

First, that the paroxysms are regular and evidently connected with menstruation—or, rather, ovulation.

Second, there must be a history of intervening clear periods.

Third, the attacks must not only consist of simple and slight disturbances, such as frequently occur in nervous women, but the mental disturbance must be well-marked.

There will, of course, be cases which do not clearly combine these three characteristics, and which yet seem to belong to the group of periodic menstrual insanity. Such are :

a. Cases in which the attacks are periodic, but which do not always correspond with the menstrual period, or in which the attacks are the result of an irritation other than that of ovulation (approaching other periodic psychoses in character). *b.* Cases in which there are no clear intervals, and where menstruation only causes an acute exacerbation of the disease (continuous psychoses). *c.* Abortive cases, in which menstruation regularly causes a neurotic disturbance, psychic in character, yet scarcely severe enough to be classed under insanity (resembling symptoms produced by normal menstruation in nervous females).

Dr. Powers believes that menstrual insanity need not necessarily be periodic in character : thus, there may be cases of menstrual insanity cured after the first attack ; or there may be cases in which the psychosis produced by the irritation of ovulation may last until the next period, when a new irritation occurs, thus precluding the occurrence of any intermission.

Dr. Powers does not agree with Krafft-Ebing, in considering the prognosis of periodic menstrual insanity as bad as that of other forms of periodic insanity ; the results obtained by the doctor would warrant a much more favorable prognosis. Of all the cases of which the author of this paper has reliable statistics, about seventy per cent. were cured. "Under proper and timely treatmeet, therefore, menstrual psychoses would appear to offer an extraordinarily good prognosis ; while in cases occurring later in life, the menopause may be expected to exert a favorable influence in their cure."

The chief method of treatment which the author followed, in nine cases treated by her, was the "preventive and symptomatic administration" of potassium bromide in proper doses ; but it is worthy of remark, that the author believes that good nursing, as well as hydrotherapy, exercise in the open air, starchy and fatty diet, and rest in bed, both before and during each menstrual period, have as much value in the treatment as the administration of drugs. [H. W. B.]

Chlorate of Potassa. Its physiological, toxic, and thera-
peutic action.   Dr. J. VAN MERING, Docent at the University of
Strassburg.   Berlin, 1885.

This elaborate monograph opens with an extensive historical
review of previous researches upon chlorate of potassa.   This
review begins with the year 1797, when Foucroy, inspired by
Lavoisier's researches on respiration, developed his theory that
nitric and chloric acids and their salts acted in the organism by
yielding up to it the large percentage of oxygen they contained.

The first application of this theory was made by a pupil of
Foucroy's, Alyon, who in the fifth year of the French Republic, used
chlorate and nitrate of potassa in the treatment of syphilis.   With
about as much reason, these salts became celebrated in several
other diseases for which an internal supply of oxygen was sup-
posed to be desirable—thus, scurvy, diabetes, typhus fever.   The
most famous illustration of this peculiar theory, which was ac-
cepted without a pretext of experimental demonstration, is the
advice of Simpson to treat women liable to abort, by chlorate of
potassa, in order to furnish oxygen to the fœtus when the placenta
was degenerated.   Virchow considered this recommendation plausi-
ble.   The other most famous application of chlorate of potassa
has been for ulcerative, gangrenous, and mercurial stomatitis.
Its utility in these affections was first asserted by Hunt in 1843,
as the result of twenty years' experience.   A great many physi-
cians added their testimony to the same effect, and the monographs
of Bergeron and Isambert (the latter in 1856) became influential.

On the basis of this clinical experience in stomatitis, the salt
was tried in diphtheria, and as late as 1877 Seëligmüller enthusi-
astically recommended it as a specific for this disease.   More
recent observation has limited the belief in its efficacy.   But it
has confirmed its value as a remedy for hyperæmia of the
buccal and pharyngeal mucosa ; and, on the other hand, has sug-
gesting new dangers from the irritative effect of the salt upon
the kidneys during elimination.

Mering reviews the researches hitherto made upon the phy-
siological and toxic action of chlorate of potassa, and then
proceeds to describe· his own.   The first chapter of these
touches upon the elimination of the salt, and the methods
of detecting it in the urine ; the second treats of the influence
of the chlorate upon albuminous metabolism ; the third, on
the alterations of the blood through chlorates and free chloric
acid ; the fourth investigates the nature of the substances which

may reduce chlorate of potassa ; the fifth inquires into the anti-putrefactive properties of chlorates, bromates, and iodates ; and the sixth describes the action of bromates and iodates upon the blood.

The determination of chlorate of potassa in the urine is important in the solution of the question whether the salt is really reduced in the animal organism, as is assumed in so many therapeutic theories. It is necessary to be able to recognize the chlorate in the presence of chlorides and perchlorates. Mering effected this by the following method. In one portion of urine the chlorine of the chlorides was directly determined by the ordinary process of decomposing the latter with nitric acid, precipitating with nitrate of silver, weighing the precipitate, and calculating from the atomic weight the amount of chlorine it contained.

In another portion of urine, the chlorates were reduced to chlorine by heating for an hour upon a water-bath with powdered zinc and diluted acetic or sulphuric acid. In the filtrate the amount of chloride was then estimated by the usual method. The difference in the result before and after reduction with zinc indicated the amount of chlorate.

The following experiment illustrates the method. Twenty c. cm. of urine yielded, after dilution and on the addition of nitric acid and nitrate of silver, 0.373 grm. of chloride of silver. Twenty c. cm. of the same urine, to which 0.5 grm. of chlorate of potassa had been added, gave, after boiling with powdered zinc, 0.954 grm. of chloride of silver. The difference is 0.581 grm., which is derived from the reduced chlorate of potassa. Theoretically, 0.5 grm. of the chlorate should have yielded 0.585 grm.; thus the practical difference was not great.

Experiments were then made upon healthy human beings, upon dogs, and upon a syphilitic patient, to all of whom chlorate of potassa was administered internally. The following results were obtained :

	Ingested.	Eliminated.
Healthy man . .	5 grms. in 5 hours.	4.62 in next 24 hours.
" " . .	3 grms. at dose.	2.7 " " " "
" " . .	1 grm. " "	0.91 " " 10 "
" " . .	0.05 grm. " "	Traces after an hour.
Syphilitic woman with mercurial stomatitis .	5 grms. in 12 hours.	4.54 grms. in 24 hrs. in urine and saliva.
Dog	15 grms. at dose.	14.5 grms. in 24 hours.
"	20 " " "	Death the next day.

These results agree with those of Rabuteau and Isambert, who also recovered in the urine almost all the chlorate ingested.

Still there is a partial reduction, which is marked in proportion to the amount of the salt ingested.

The influence of chlorate of potassa upon the albuminous metabolisms of the organism was subjected to a second series of experiments. By means of the Voit method, a dog was brought into the condition of "nitrogenous equilibrium," and then chlorate of potassa administered, and its effects upon the elimination of urea estimated. After a dose of twelve grms., a dog that on two preceding days had excreted 610 c. cm. urine with 70.02 grms. urea, and 580 c. cm. with 72.04 grms. urea, excreted 770 c. cm. urine with 85.3 grms. urea. The proportion of both urine and urea returned to the original standard on the following day. The chlorate was shown thus to act as a diuretic analogous to chloride of sodium, acetate of potassa, and other neutral salts. The author infers that an increased decomposition of albumen also takes place. But the results may be equally interpreted as indicating an increased outstreaming from tissues of the urea formed in their elements from the albumen circulating through them.

The third series of experiments examined the alterations of the blood which might be caused by chlorate of potassa. The general effect was first tested by mixing defibrinated ox blood with a five-per-cent solution of chlorate of potassa. The blood immediately assumed a clear red color, which passed in two hours to a reddish brown. Examined in the spectroscope the mixture showed two oxyhæmoglobine lines. After four hours these were replaced by two methæmoglobine lines (between D and F). After twenty-four hours the mixture was coagulated, brownish black, and gave the hæmatine spectrum.

Similarly, chlorate of potassa, added to a concentrated solution of oxyhæmoglobine, formed brownish-black masses ; and we may infer that a prolonged action of chlorate of potassa on the blood results in the formation of hæmatine. The alteration proceeds much more rapidly with a warm than a low temperature, and is proportioned to the amount of the chlorate used. At 22° C. o. 2 grm. and at a temperature of 37° C. o. 1 grm. of chlorate sufficed to generate methæmoglobine in 100 c. cm. blood within twenty-four hours.

When the blood was first mixed with a large quantity of CO_2 the addition of chlorate of potassa altered it much more rapidly than was otherwise the case. Dyspnœic blood was altered twice as fast

as arterial blood. The blood was obtained from the carotid of the same animal in both cases, but in one dyspnœa was excited by compression of the trachea. The alteration of the hæmoglobine was again greatly facilitated by even a slight diminution in the alkalescence of the blood (effected by the addition of a little acid phosphate of soda). On the contrary, the alteration was much retarded by the addition of a trifling quantity of caustic soda or carbonate of soda.

It is difficult to estimate how far these laboratory experiments may be taken to indicate changes in the blood by the internal toxic, still less by the internal therapeutic, administration of chlorate of potassa.

Analogous experiments were instituted to ascertain whether during the alteration of the hæmoglobine the chlorate of potassa suffered any change. Examination of the blood in which methæmoglobine had formed proved a partial reduction of the chlorate to chloride, without any simultaneous formation of perchlorate. The following are some of the results:

Mass of Blood.	Temp.	Duration.	$KClO_3$ Used.	$KClO_3$ Reduced.
100	22° C.	6	5,00	0,170
"	"	20	5,00	0,480
"	"	24	0,050	Not reduced.
"	"	48	0,005	0,005
"	25°·C.	30	5,00	0,89
"	37° C.	6	5,00	0,81

Thus the reduction, by the same temperature and duration of the experiment, is dependent upon the absolute quantity of chlorate ingested. Small quantities were completely reduced; larger quantities always left a considerable, indeed by far the greater, proportion unreduced. This observation correlates those upon elimination, which showed a more abundant elimination of uncharged salt in proportion to the increase in the dose.

Normally, the author admits, in the circulation of a living animal, the reduction suffered by the chlorate is so insignificant that it may easily be overlooked. Thus there is no reason to suppose that methæmoglobine would form in the blood of a man of 65 kilos. with a blood mass of 5 kilos., who for several days should take a gramme of chlorate every hour. Yet this is certainly an excessive dose.

Lecithin, a constituent of the blood corpuscles; sugar, a constant constituent of the blood; fibrine, blood serum, were all tested as to their capacity to reduce chlorate of potassa. The re-

sults were negative. A watery solution of red blood corpuscles and a solution of pure hæmoglobine did, however, effect the reduction. It is to be inferred that the reduction observed after admixture of the salt with blood, or, to a much less extent, after its internal administration, is due to oxyhæmoglobine.

The blackish masses formed by the prolonged action of chlorate of potassa on the blood, resist putrefaction for a long time, and the same antiseptic action is exercised by bromates and iodates. Bromates also reduce hæmoglobine, but more slowly than chlorates, while iodates have no effect at all.

The chapter of the monograph which the author devotes to general conclusions considers at some length the elementary conditions in acute poisoning from chlorate of potassa, and the means of treatment. Finally we have a few words on the legitimate therapeutic applications of this famous remedy.

The most reliable indication for its use is still diseases of the buccal cavity, especially stomatitis mercurialis, but also for stomatitis ulcerosa ; while, according to the author, the chlorate is of doubtful utility in aphthous stomatitis, tonsillitis, and sprue. It is extremely useful in ozæna ; is without action in diphtheria in small doses, and dangerous in large, " because in diphtheria are present all the conditions which favor the toxic action of the chlorate on the blood, as dyspnœa, high fever, anorexia, nephritis." It should, therefore, be employed chiefly as a gargle.

The favorable action of chlorate of potassa upon ulcerations of the buccal and nasal mucosa depends upon the oxygen contained in the chloric acid. The carbonic and other acids present in the mouth gradually decompose the salt and oxygen is given off, which exerts a gentle but permanent caustic action on the ulcerations and finally effects their cure. This local action is of much greater value than any which can be obtained from the internal administration of chlorate of potassa—opinion diametrically opposed to that expressed by Isambert, but, from the facts adduced, not without plausibility.

Mering closes with an energetic protest against the popular use of chlorate of potassa, and the habit of freely prescribing it by apothecaries without a medical prescription. " There are few medicines possessed of such marked toxic qualities which are used as extensively as chlorate of potassa." In 1875 419 kilogrammes were used in the Paris hospitals. The author, with somewhat superfluous energy, denounces the use of certain pastilles (pastilles de Dethan), each of which contains 10 centigrammes

of chlorate of potassa (about 1½ grains). A package of these pastilles contains 10 grammes (150 grains), and that might easily cause the death of a child. But when would such an amount be swallowed?

Many voices have recently been raised in warning in regard to the dangers of chlorate of potassa, especially the danger of nephritis. But we think the author's own experiments tend rather to show that such warning, however appropriate for large doses, does not really apply to the doses habitually employed—say 4 to 5 grains hourly, or 96 to 120 grains in 24 hours, if so many doses were taken (6 to 7 grammes in 24 hours).

The net result of these careful and elaborate experiments should be, on the whole, to greatly limit the use of a drug which upon the basis of slender analogies, has been almost vaunted as a panacea.   [M. P. J.]

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TO THE

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